DOCUMENT RESUME

ED 272 689 CE 044 776

AUTHOR	Harp, Keith; Steward, Jim
TITLE	Vocational Agriculture II.
INSTITUTION	Oklahoma State Board of Vocational and Technical Education, Stillwater. Curriculum and Instructional Materials Center.
PUB DATE	86
NOTE	1,230p.; For Vocational Agriculture I, see ED 250 567. Printed on colored paper.
AVAILABLE FROM	Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, OK 74074 (In-state--$10.00; out-of-state--$25.00).
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF09 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Agricultural Education; *Agricultural Engineering; *Agronomy; *Animal Husbandry; Behavioral Objectives; Instructional Materials; Leadership Training; Learning Activities; Lesson Plans; Money Management; Postsecondary Education; Secondary Education; State Curriculum Guides; Transparencies; *Vocational Education
IDENTIFIERS	*Oklahoma

ABSTRACT

This curriculum guide was developed for second-year courses in vocational agriculture in Oklahoma. The curriculum contains 5 sections organized in 16 instructional units. The units follow a standard format established in 1970 for development of instructional materials for all Oklahoma vocational teachers. This format includes eight basic components that form a unit of instruction: performance objectives, suggested activities for the teacher, information sheets, assignment sheets, job sheets, transparency masters and supplements, tests, and answers to tests and assignment sheets. (Depending on the specific objectives, there may or may not be transparency masters, supplements, student supplements, assignment sheets, or job sheets included in the unit of instruction.) All of the unit components focus on measurable and observable learning outcomes. The units in this curriculum cover the following topics: (1) leadership--write, deliver, and evaluate a speech; (2) finance--handle finances, obtain and use credit; (3) plant and soil science--analyze the crop industry, select soil-conservation practices, evaluate plant growth and reproduction, select seed and prepare seedbed, control crop pests and diseases; (4) animal science--interpret nutritional information, maintain animal health, control livestock diseases and parasites; and (5) agriculture mechanics--use power tools, perform position shielded metal-arc welding, perform oxyacetylene welding and brazing, plan project construction, maintain farm plumbing. (KC)

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ED272689

Vocational Agriculture II

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Developed by the
Curriculum and Instructional Materials Center
For the Division of Vocational Agriculture
Ralph Dreessen, State Supervisor
Oklahoma State Board of Vocational and Technical Education
John Folks, Chairman
Roy Peters, Jr., Director
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1986

86-003997

AG 1002

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Curriculum and Instructional Materials Center

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State Department of Vocational and Technical Education
Stillwater, Oklahoma 74074

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VOCATIONAL AGRICULTURE II

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FOREWORD

Recently agriculture has been experiencing the most adverse times seen since the 1930s, and as a result, fewer students are planning to enter the field of production agriculture. However, we vocational and technical agriculture educators know that in the future more and more individuals will be needed to fill careers in agribusiness dealing with selling, servicing, and processing agricultural products. We also know that the students enrolled in vocational agriculture today will be the leaders of tomorrow in those careers. With proper instructor planning and student time-on-task, the materials in *Vocational Agriculture II* will continue the foundation of knowledge and skills begun in *Vocational Agriculture II*—a foundation students will need for assuming those roles of leadership.

Roy Peters, Jr., Director
Oklahoma State Department of
Vocational and Technical Education

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Vocational Agriculture
Oklahoma State Department of
Vocational and Technical Education

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PREFACE

Our educational system is being observed more closely today—perhaps more closely than ever before. And, in the '80s, many drastic changes have come about in agriculture—changes more drastic perhaps than we vocational and technical agriculture educators have ever seen before. As a result of the drastic changes in agriculture in particular and of the ongoing scrutiny of education in general, the need for improvement in our instructional systems has become critical.

One component of a strong instructional system is quality instructional materials. The idea of providing quality instructional materials was constantly in our minds as we revised and developed *Vocational Agriculture II.* We tried to acquaint students with some of the new, updated technology in agriculture, yet still include the basics of vocational agriculture introduced in the previous manual. And we tried to strengthen each unit—for the teacher as well as for the student. The number of assignment sheets and job sheets has been greatly increased over the previous manual and the scope of the suggested-activities section of each unit was greatly expanded to include numerous teaching ideas and supplemental materials.

We encourage you, the instructor, to study each unit—especially the suggested-activities section—and prepare a method of delivering a quality lesson. With proper preparation and a well-planned delivery, you can help your students learn and develop to become the agricultural leaders of tomorrow.

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ACKNOWLEDGEMENTS

A great amount of research, writing, validating, and editing goes into the development of instructional materials such as these. Many talented people have given of themselves to produce these materials. We, the writers, extend our sincere thanks to the following individuals serving on the validation committees.

Vocational Agriculture Teachers and Representatives from Production Agriculture and Agribusiness

Teachers

Alvin Beadles
Loyd Fletcher
Larry Harvey
Dwight Surface
Gary Montgomery
Jack Statts
Charles Arthur
Cecil Bratton
John Kinney
Delbert Lantz

Industry representatives

Myron Denney
Oliver Kinzie
Earl Marshall
Frank McCalla
Don Rudy
Troy Don Henry
Richard Moore
Gene Benson
Randy Dupree
Lee Snaithman
Darrell Stiles

A special thank you is extended to staff members of Oklahoma State University. They have given unselfishly of their time and expertise to assist the writers on this project. These individuals are Don Wagner, Don Topliff, David Freeman, Joe Hughes, Bill Crutcher, Bob Kropp, Jim Oltjen, and Mark Fink—all Animal Science Department staff members. From the Agronomy Department, appreciation is extended to Kevin Donnelly, Lewis Edwards, and Jim Steigler. A special thanks also goes to Stanley Coppock in the Entomology Department. We also want to express appreciation to Verlin Hart, vocational agriculture district supervisor, for his input and support during committee meetings and to Kent Boggs, FFA executive secretary, for his help on the public speaking unit. A special thanks goes out to the staff at Bradley Plumbing in Stillwater and to Steve Schroeder, Stillwater Agri-Center, for his help with both plant and animal agricultural chemicals.

As a part of the total team working for vocational agriculture in Oklahoma, we wish to thank the following vocational agriculture supervisors and teacher educators for their input and encouragement.

Ralph Dreessen
Joe Raunikar
Eddie Smith
Marvin Lindsey
Bob Mitchell
Raymond Cockrum
Verlin Hart
Kent Boggs

Robert Terry
James Key
Jack Pritchard
Wes Holley
James White
Eddie Finley
Jay Lark
George Cook
Gale Hagee
Anna Beth Neason

A very special thanks goes out to the staff members of the Curriculum and Instructional Materials Center (CIMC). Bob Patton, coordinator, provided the necessary guidance and encouragement needed for the project. Thanks also goes out to Joyce Sawatzky, assistant coordinator. Special appreciation is also extended to Janet Sloan, secretary, for her typing of manuscripts, processing of paperwork, and copying of units for committee meetings.

A large project like this is only possible with the help of other dedicated CIMC staff members who handle this material through the production phase. Sue Buck, Jerry Weir, Marsha Sneed, and Susan Walker gave much of their talents and efforts to the editing tasks associated with this publication. Thanks also to Robert Hilley and Terri Barnes for their coordination efforts through the production phase of the materials. A thank you is also extended to Terrell Ogilvie, OSU technical writing intern, for his work on some supplements and the public speaking unit.

Other phases of the production on this project were done in the art department and the communications center of the State Department of Vocational and Technical Education. For their hard work, special appreciation is extended to Bob Davis, art manager, and artists Gary Bradley, Kim Hale, Kathryn Hansen, Robert Randall, and Scott Stone. In the communications center, a thank you is extended to Debbie Hixson, manager, and typists Rose Primeaux, Stephanie Shipley, and Lisa Tomlinson.

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USE OF THIS PUBLICATION

Instructional Units

Vocational Agriculture II contains five sections and sixteen instructional units. A standard format was established in 1970 for development of instructional materials for all Oklahoma vocational teachers. This format includes eight basic components that form a unit of instruction: performance objectives, suggested activities for the teacher, information sheets, assignment sheets, job sheets, transparency masters and supplements, tests, and answers to tests and assignment sheets. Depending on the specific objectives, there may or may not be transparency masters, supplements, student supplements, assignment sheets, or job sheets included in the unit of instruction.

All of the unit components "zero in" on measurable and observable learning outcomes. Teachers are encouraged to supplement, personalize, localize, and motivate with these materials in order to develop a complete teaching/learning process.

Units of instruction are designed for use in more than one lesson or class period of instruction. Careful study of each unit of instruction by the teacher will help him or her determine the following

- Amount of material that can be covered in each class period
- Skills that must be demonstrated
    Supplies and equipment needed
    Amount of practice needed
    Amount of class time needed for demonstrations
- Supplementary materials, such as pamphlets and filmstrips, that must be ordered
- Resource people to contact

Performance Objectives (white pages)

Each unit of instruction is based on the performance needed for successful employment in an occupational area. Performance objectives are stated in two forms: unit objectives, stating the subject matter to be covered in a unit of instruction; and specific objectives, stating the performance necessary to reach the unit objective. Since the objectives of the unit provide direction for the teaching/learning process, it is important that teachers and students have a common understanding of the intent of the objectives.

The objective sheet should be given to students and referred to throughout the teaching/learning process. This will help answer any questions concerning performance requirements for each instructional unit. The objectives can also help determine teaching strategies and instructional methods. Prepare for each unit by deciding how each objective can best be taught.

The objective sheet may also be used as a quick pretest to determine students' prior knowledge and to determine whether further study or activities are necessary. Teachers should feel free to modify, delete, or add objectives in order to meet the needs of the students and community. When changes in objectives are made, the teacher should remember to supply the needed information, assignment and/or job sheets, and criterion test items.

Suggested Activities and Supplements (pink pages)

Suggested activities are included only in teacher materials. The suggested activities pages include an outline of the unit contents and an instructor's guide designed to assist teachers in planning their presentation of the unit. The instructor's guide provides suggestions for delivery and/or presentation during the instructional process. Read the suggested activities before teaching the units so that supplemental materials can be obtained, audiovisual materials prepared, and outside resources contacted. Duties of the teacher will vary according to the particular unit.

The references that are listed in the suggested activities are ones used in the development of each unit. They may be used by the teacher to supplement her or his knowledge of the subject area or to help students with particular interests or occupational objectives in the area covered.

The suggested activities section of the unit also includes supplements and transparency masters. Each of these components provides information in a special way. Supplements may consist of motivational materials, review, or practice materials such as charts and reference materials. Supplements are designed to be copied and distributed to individual class members or to the class as a whole. Suggestions for their use are included in the instructor's guide. Transparencies direct the class' attention to the topic of discussion. Transparencies may present new information, or they may reinforce information presented in the information sheet. They are particularly effective when identification or analysis is necessary. Order transparencies from the Curriculum and Instructional Materials Center, or make transparencies and place them in the notebook where they will be immediately available for use.

Information Sheet (green pages)

The information sheet provides "must know" content essential for meeting the cognitive (knowledge level) objectives of the unit. The information is written in a topical-outline form and is keyed to the specific objectives.

Teachers will find that the information sheet serves as an excellent guide for presenting background knowledge necessary to develop the skills specified in the unit objective. The information sheet may also be used for coordination activities and advisory committees.

Students should read the information sheet before the information is discussed in class. Space is provided in margins for students and teachers to add notes that supplement, localize, personalize, or provide motivation for each unit.

Student Supplements (white pages)

Student supplements consist of charts or reference materials that are made available to each class member. Students may use them to complete assignment or job sheets or keep them for future reference.

Assignment Sheets (brown pages)

Assignment sheets give students a chance at problem solving, self-assessment, and/or practical experience. They assist students in the application of knowledges that are necessary prerequisites to skill development. Assignment sheets may be given to the student for completion in class or may be used for homework assignments. Answer sheets are provided when appropriate and can be used by the student and/or teacher for checking student progress. The scores of those assignment sheets listed in the specific objectives should be averaged with the unit test score, as the skills addressed in these assignment sheets are considered necessary in meeting the unit objective.

Job Sheets (blue pages)

Job sheets are another important segment of a unit of instruction. The job sheets provide a list of equipment, tools, and materials needed to complete a manipulative or psychomotor skill. They describe a step-by-step procedure needed to complete each task or job. Diagrams, photographs, and illustrations are provided to assist students in achieving the skill.

The teacher should demonstrate to students the procedures outlined in each job sheet. Furthermore, the teacher needs to localize the job sheet according to the equipment and supplies available in the local lab or shop situation. Job sheets also furnish potential employers with a picture of the skills being taught and the performances they might reasonably expect from a person who has had this vocational instruction.

Job sheet performance should be evaluated by the instructor and averaged with the unit test score, as the skills addressed in the job sheets are considered necessary in meeting the unit objective.

Tests (yellow pages)

The test provides criterion-referenced evaluation of every objective listed in the unit of instruction. It is crucial to note that both paper/pencil and performance objectives must be evaluated.

It is recommended that the tests be divided into shorter tests covering three or four objectives at a time and given soon after those objectives have been covered. A selection of questions from the units covered may be used for final tests at the end of each term if desired. If objectives have been added, deleted, or modified, be sure to make the changes on the test.

The acceptable response on a unit test, 85 percent in most units, may be raised or lowered to fit the topic or students' ability levels. The percentage applies to the overall score, not to each question. The final unit grade should be obtained by using the paper/pencil score and evaluations of student demonstrations of the desired skills.

Answers to Test and Assignment Sheets (pink pages)

Answers to test and assignment sheets are components designed to assist the teacher in evaluation of student performances.

Page Numbering

Each publication from the Curriculum and Instructional Materials Center (CIMC) is assigned a specific abbreviation. For example, *Vocational Agriculture II* has been abbreviated VO AG II. The units are then numbered consecutively within each section. An example of a page number is VO AG II-1-A. Since CIMC publications are loose leaf, this system of page numbering was adopted so that pages from different manuals would not get mixed up.

Methods of Disseminating Material

Material may be given out a unit or page at a time to keep the material before the student always new. Some teachers ask students to furnish a three-ring binder for the units. This is convenient for taking the materials home to study. Upon completion, each unit is then placed in a larger binder. The large binders may be purchased at cost from the CIMC. Some teachers store the materials by units in filing cabinets or boxes until needed. All the units may be given out at once if desired.

For best results, provide student materials for each student. Student materials contain everything but the test answers, answers to assignment sheets, and suggested activities. All tests are collated at the back of student material and should be removed and stored until needed.

Teaching Methods

It is a challenge to keep students motivated. Supplement the objectives by providing the "why," personal experiences, and current information. Prepare for each unit by deciding how each objective can best be taught. Allow students to become involved in preparing and planning.

Competency Profiles

Competency profiles are folders used to document student performance. The profile contains a list of the specific job competencies that a student should achieve prior to leaving the training program. Competency profiles may be ordered from the State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.

CORRECTIONS AND SUGGESTIONS

The Curriculum and Instructional Materials Center (CIMC) wants to provide vocational instructors and students with materials that are accurate and effective. Although the CIMC strives to maintain the highest standards of development and production, oversights occasionally do occur. If you find any errors in this or other CIMC publications, or have suggestions for improving their usefulness in vocational programs, please notify the CIMC staff. One easy way of pointing out errors is to make a photocopy of the affected page and to indicate the correction on the copy. You can mail the information to the CIMC, where it will be used to correct the publication before the materials are reprinted.

To ensure that the material is updated on a timely basis, it is important that you notify the CIMC of necessary corrections as soon as possible after discovering the error. Do not assume that someone else will notice the error and inform the CIMC; other users may be making the same assumption. Please send corrections and recommendations for improving this publication to the following address:

Curriculum and Instructional Materials Center
Oklahoma State Department of Vocational and
Technical Education
1500 West Seventh Avenue
Stillwater, Oklahoma 74074

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

UNIT OBJECTIVE

After completing this unit, the student should be able to select a speech topic for a six- to eight-minute speech on some phase of vocational agriculture, gather information for the speech, deliver the speech, and evaluate another student's speech. The student will show this ability by completing the assignment sheets and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with writing and evaluating speeches.
2. Match phases of communication to their correct definitions.
3. Select from a list guidelines for preparing a successful speech.
4. Arrange in order steps to follow in writing a speech.
5. Select from a list guidelines to follow when gathering information for a speech.
6. State rules for using quotations and statistics in a speech.
7. Discuss reasons for using outlines.
8. Match principal parts of an outline to their correct definitions.
9. Define types of outlines.
10. State ways to develop proper delivery.
11. Select from a list ways to develop and add meaning to the delivery of a speech.
12. State reasons for using gestures when giving a speech.
13. State ways to make a good impression when delivering a speech.
14. List factors to consider when listening to and evaluating a speech.
15. Select a speech topic and gather information for a six- to eight-minute speech.
16. Write an outline for a six- to eight-minute speech.
17. Write an introduction for a six- to eight-minute speech.

OBJECTIVE SHEET

18. Write the body of a six- to eight-minute speech.
19. Write the conclusion of a six- to eight-minute speech.
20. Give a six- to eight-minute speech.
21. Evaluate another student's speech.

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

SUGGESTED ACTIVITIES

I. Unit contents

  A. Objective sheet

  B. Suggested activities

    1. Supplement #1 — Speech Contests Open to FFA Members in Oklahoma

    2. Transparency masters

      a. TM #1 — What Is an Outline?

      b. TM #2 — Principal Parts of an Outline

      c. TM #3 — What Should an Outline Look Like?

      d. TM #4 — Topical Outline Style

      e. TM #5 — Sentence Outline Style

      f. TM #6 — Judge's Score Sheet, State Public Speaking Contest—Future Farmers of America

  C. Information sheet

  D. Assignment sheets

    1. Assignment Sheet #1 — Select a Speech Topic and Gather Information for a Six- to Eight-Minute Speech

    2. Assignment Sheet #2 — Write an Outline for a Six- to Eight-Minute Speech

    3. Assignment Sheet #3 — Write an Introduction for a Six- to Eight-Minute Speech

    4. Assignment Sheet #4 — Write the Body of a Six- to Eight-Minute Speech

    5. Assignment Sheet #5 — Write the Conclusion of a Six- to Eight-Minute Speech

    6. Assignment Sheet #6 — Give a Six- to Eight-Minute Speech

    7. Assignment Sheet #7 — Evaluate Another Student's Speech

    8. Assignment Sheet #8 — Fill Out a Contestant's Certification Form

  E. Answers to assignment sheets

  F. Test

SUGGESTED ACTIVITIES

G. Answers to test

II. Instructor's guide

A. Review unit and plan presentation.

B. Obtain materials to supplement unit.

1. Films

(NOTE: Films *a*, *b*, and *c* are available to Oklahoma teachers on a free-loan basis. Oklahoma teachers may order from the Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074. Out-of-state teachers must order from the addresses listed with the films.)

a. *JJ Gets Ready*. Color, 10 minutes, Journal Films, 1977. Available from Journal Films, Inc., 930 Pitner Avenue, Evanston, Illinois 60202; phone, 800-323-5448 or 312-325-6700.

(NOTE: In this film, JJ and the viewers are introduced to the techniques and procedures of preparing to deliver a speech.)

b. *JJ Gets to His Feet*. Color, 10 minutes, Journal Films, 1977. Available from Journal Films, Inc., 930 Pitner Avenue, Evanston, Illinois 60202; phone, 800-323-5448 or 312-325-6700.

(NOTE: In this film JJ learns the techniques that will help him to relax, deliver an effective presentation, and become a successful speaker.)

c. *Oral Communication*. Color, 28 minutes, National AV Center, 1976. Available from the National AV Center, General Service Administration, Section FF, Washington, D.C. 20409.

(NOTE: The film emphasizes two important aspects of oral communication: delivery and human relations. Appropriate choice of words, speed of speech, and body language are highlighted. Tips on listening carefully, avoiding arguments, encouraging the other person, and smiling are also illustrated.)

d. *Speaking to One or One Thousand*. Color, 21 minutes, 1980. Available on 16-mm film or 3/4-inch videotape. Purchase price is $545, but the film can be rented. Available from McGraw-Hill Training Systems, Education Department, McGraw-Hill Book Company, 674 Via de la Valle, P.O. Box 641, Del Mar, California 92014; phone, 691-453-5000.

(NOTE: This film gives Toastmasters International's tips and dos and don'ts for making a presentation.)

2. Book — *See You at the Top*. Available from Pelican Publishing House, 630 Burmaster Street, Gretna, Louisiana 70053.

(NOTE: This book gives Zig Zigler's tips on planning your goals in life, selling yourself to others, and maintaining a positive self-image.)

SUGGESTED ACTIVITIES

3. Videotape or cassette — *Prepared Public Speaking*. Available from National FFA Supply Service, National FFA Center, 5632 Mount Vernon Memorial Highway, P.O. Box 15160, Alexandria, Virginia 22309.

   (NOTE: This tape consists of the winners of the national speaking contests as they are giving their award-winning speeches.)

4. Equipment and materials needed for assignment sheets

   a. Farm journals, magazines, and other sources for students to use as reference materials for speeches

   b. 3×5 index cards

   c. Copies of Judge's Score Sheet (see Transparency master #6) as needed

   d. Clock to use while timing speeches

   e. Video camera and recorder, microphone system, and tape recorder to record students when they give their speeches

5. Transparencies and competency profiles

   (NOTE: Transparencies and competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Arrange a field trip to the school or public library, and ask the librarian to be prepared to show your students reference materials that would help them write speeches on agriculture-related subjects. While at the library, copy a page of entries from the *Reader's Guide to Periodical Literature.*

D. Make a videotape of a farm program that appears on television, and note where the speaker uses quotations and statistics to make a point.

E. Introduce unit.

SUGGESTIONS:

- Display Supplement #1, which lists the speech contests open to FFA members in Oklahoma; also display the FFA awards booklet. Discuss with students the opportunities available to winners of the state contests.

- Explain to students the benefits of practicing giving speeches while in high school. Point out that in their adult lives they will be required to speak to groups of people, giving either formal or informal presentations. If students practice speaking in front of groups now, they will be more at ease when they are required to do so later.

- Point out some pertinent passages from the book *See You at the Top*, and then make the book available to your students.

SUGGESTED ACTIVITIES

- Introduce the film *Oral Communication*, and then show it to the class.

F. Provide students with unit.

G. Discuss unit and specific objectives.

H. Discuss information and assignment sheets.

1. Use Information Sheet, Section I to discuss terms and definitions associated with writing and evaluating speeches.

   SUGGESTIONS:

   - Have students collect pictures from magazines to show different gestures. Display these pictures in the classroom, and ask students to identify the ideas being communicated by each picture.
   - Give students the assignment of watching TV commercials for one night, taking notes on commercials, and then reporting to the class about the commercials that make the best use of gestures to convey their messages.
   - Show the class the page of entries you have copied from the *Reader's Guide to Periodical Literature*, or take the students to a library where all the volumes of the guide are available. Explain to students how the guide is used.

2. Use Information Sheet, Section II to discuss the phases of communication and their definitions.

   SUGGESTIONS:

   - Explain the difference between *hearing* a speaker and really *listening* to a speaker. Listening involves staying alert, resisting distractions, noting nonverbal cues, and concentrating on what the speaker is saying—receiving, processing, and evaluating the speaker's message.
   - Explain the difference between *talking* and *speaking*. Speaking involves using effective verbal skills (such as proper diction, grammar, pronunciation) as well as effective nonverbal skills (such as visible body movements, facial expressions and gestures, and posture) to communicate a message.
   - Explain the term *particular purpose* in each of the definitions presented in this section of the information sheet. Point out that people give speeches for one of three reasons: to inform the audience, to persuade the audience, or to integrate the members of the audience (pep talks, speeches of welcome, introductions). People listen to speeches to be informed on a subject, to hear reasons why they should be persuaded by the speaker, and to be integrated into a group.

SUGGESTED ACTIVITIES

List the words *inform*, *persuade*, and *integrate* as three column headings on the chalkboard. Then conduct a class discussion, asking students to give examples of speech topics that might fit under these headings. Give each student an opportunity to come up with a speech topic until it seems the possibilities are exhausted.

EXAMPLE: A speech about encouraging people to join the FFA alumni association should be classified under the *persuade* column.

3. Use Information Sheet, Section III to discuss guidelines for preparing a successful speech.

SUGGESTIONS:

- Explain that knowing your audience is one of the most important aspects of a successful speech. Use the following example to illustrate your point. No matter how good the speech, members of a swine breeders association are not likely to be very interested in a speech entitled "The Cattle Industry in Oklahoma."
- Discuss the rest of the guidelines, continuing with the example used for the first guideline. For instance, to illustrate the guideline "choose information that is current and timely," tell students that swine breeders would probably not be interested in a speech about the ways to medicate swine, because they have heard all that before. However, they are more likely to really listen to a speech about the new methods of controlling pseudorabies.

4. Use Information Sheet, Sections IV through IX to discuss information students will need in writing a speech: steps to follow in writing a speech, guidelines to follow when gathering information for a speech, rules for using quotations and statistics in a speech, reasons for using outlines, principal parts of an outline, and the types of outlines.

SUGGESTIONS:

- Discuss with students the importance of following the order of the steps presented in Section IV of the information sheet. Explain that they will save themselves much time and energy if they do not get the cart before the horse when writing a speech.
- When discussing Section V, point out to students the various trade magazines and journals available to them in the classroom. Show students how to complete tasks associated with researching a subject. For example, show students how to use a table of contents in a magazine to locate articles, how to scan an article to determine its usefulness as a reference, and how to record key information (take notes) from a useful article.
- Take students on a prearranged field trip to either the school or public library.

SUGGESTED ACTIVITIES

- When discussing Section VI, emphasize that although using statistics and quotations in a speech can serve to help the speaker make a point, their use should be limited, and when used, they must be quoted precisely and in context and be correctly identified as to source and date. Show students how to record quotations and statistics on index cards.

  Play the videotape you made of a farm program. As the speaker uses a quotation or statistic, stop the player and point out the information the speaker presented. Have the class discuss the effectiveness of using quotations and statistics in this speech.

- When discussing Sections VII through IX, point out that outlining is a basic skill used to create the framework in all forms of communication. Explain that students will save time in organizing their ideas and in recognizing their speeches' strengths and weaknesses if they will make outlines *before* attempting to write their speeches. Use Transparency #1 to illustrate your discussion.

  Discuss the parts of an outline, using Transparency #2 to illustrate your discussion.

  Discuss the types of outlines, using Transparencies #3 through #5 to illustrate your discussion.

- Discuss Assignment Sheets #1 through #5. Guide students through these assignment sheets in the order they are presented, and have students turn in one assignment sheet for evaluation before they proceed to the next assignment sheet.

5. Use Information Sheet, Sections X through XIII to discuss information students will need in delivering a speech: ways to develop proper delivery, ways to develop and add meaning to the delivery of a speech, reasons for using gestures when giving a speech, ways to make a good impression when delivering a speech.

   SUGGESTION:

   - Introduce and then show the films *JJ Gets Ready* and *JJ Gets to His Feet*, or *Speaking to One or One Thousand*. Ask students to take notes over the methods to develop delivery that are presented in the films. Then have your students volunteer the methods they have listed as you discuss each and write it on the board.

6. Use Information Sheet, Section XIV to discuss factors to consider when listening to and evaluating a speech.

   SUGGESTIONS:

   - Point out that the factors listed in the information sheet are based on the factors for evaluation on the judge's score sheet used during official Oklahoma FFA public speaking contests. Discuss each of the factors listed, and use Transparency #6 to illustrate your discussion.

SUGGESTED ACTIVITIES

- Explain that evaluating someone else's speech will also assist you in evaluating the quality of your own speech.
- Introduce the videotape or cassette tape of *Prepared Public Speaking*, and then show or listen to the tape, asking students to use the factors listed in the information sheet to evaluate the strengths of each of the national winning speakers presented. Discuss students' evaluations after showing or listening to the tape.

7. Discuss Assignment Sheets #6 and #7, and then have students complete each assignment sheet.

SUGGESTIONS:

- In Assignment Sheet #6, every student will be required to present the speech he or she has written. Videotape each speech to use as a tool for evaluation and discussion.
- In Assignment Sheet #7, students are asked to evaluate one speech only. However, if time permits, you may want to make more copies of the judge's score sheet so that students may evaluate all the speeches presented by fellow students.

8. Discuss Assignment Sheet #8 and have students complete.

I. Give test.

J. Critique test and discuss in class.

K. Reteach and retest as necessary.

L. Complete appropriate sections of competency profile.

III. Unit references

A. Carnegie, Dale. *How to Develop Self-Confidence and Influence People by Public Speaking*. New York: Pocket Books, Inc., Division of Simon and Schuster, 1977.

B. Eisenson, Jon, and Paul H. Boase. *Basic Speech*. New York: The MacMillan Company, 1975.

C. *How to Make Better Speeches*. New York: Cities Service Oil Company, Division of Marketing Training, 1964.

D. *Leadership of Youth Groups*. Kansas City: Farmland Industries, n.d.

E. Oliver, Robert T., and Rupert L. Cartright. *Effective Speech*. New York: Holt, Rinehart, and Winston, n.d.

SUGGESTED ACTIVITIES

F. Patton, Bob. *Vocational Agriculture II: A Curriculum Guide*. Stillwater, Oklahoma: Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1975.

G. Patton, Bob, Greg Pierce, and Joyce Sawatzky. *VICA: Learn, Grow, and Become*. Stillwater, Oklahoma: State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1984.

H. Patton, Bob, and Keith Harp. *Vocational Agriculture I: A Curriculum Guide*. Stillwater, Oklahoma: State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1984.

I. Zigler, Zig. *See You at the Top*. Gretna, Louisiana: Pelican Publishing Company, 1982.

SUGGESTED ACTIVITIES

SUPPLEMENT #1 — SPEECH CONTESTS OPEN TO FFA MEMBERS IN OKLAHOMA

A. FFA-sponsored speech contests

1. Prepared Public Speaking Contest

   (NOTE: A speech for this contest must be on an FFA- or agriculture-related subject. The winner of the state contest participates in a subregional contest. The top two speakers from each subregional contest participate in a regional contest, and the winner from each regional contest participates in the national contest.)

2. Extemporaneous Public Speaking Contest

   (NOTE: The contestants at this contest draw three topics and then choose the topic they wish to speak on from one of those three. Each contestant is allowed thirty minutes to prepare a three- to five-minute speech. The contestants present their speeches and then must answer questions put to them by the contest judges. The winner of the state contest participates in a subregional contest. The top two speakers in each subregional contest participate in a regional contest, and the winner from each regional contest participates in the national contest.)

3. Soil-Conservation Speech Contest

   (NOTE: The topics for this contest must be related to soil-conservation techniques and modern soil- and water-conservation practices.)

4. Bankers Speech Contest

   (NOTE: Topics for this contest must be about the relationship between banking and agriculture.)

5. Greenhand Public Speaking Contest

   (NOTE: This contest is for freshman FFA members only, and the speech topic must be on an FFA- or agriculture-related subject.)

6. Dairy Speech Contest

   (NOTE: Topics for this contest must be on some type of dairy product and its promotion.)

7. Co-Op Speech Contest

   (NOTE: Topics for this contest may be on any subject related to agricultural cooperatives.)

SUGGESTED ACTIVITIES

8. Animal Science Public Speaking Contest

   (NOTE: Every year prior to the contest, Oklahoma State University's Animal Science Department announces a new topic for this contest.)

9. Creed Speaking Contest

   (NOTE: This contest, for freshmen only, consists of speakers reciting the FFA Creed.)

B. Non-FFA-sponsored speech contests

(NOTE: The following contests have their own rules, and winners advance to the state level only.)

1. State Fair Speech Contests

   (NOTE: FFA members only compete in one of the contests held in Oklahoma City, Tulsa, or Muskogee. Speeches must be on an FFA- or agriculture-related subject.)

2. Farmers Union Public Speaking Contest

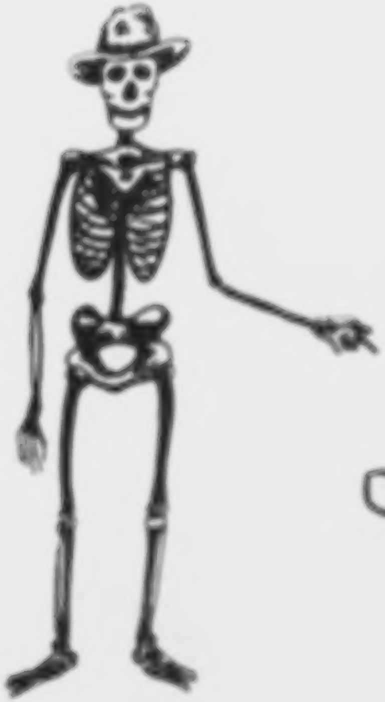
   (NOTE: This contest is open to FFA members and to members of several other organizations.)

3. Young Farmers Speech Contest

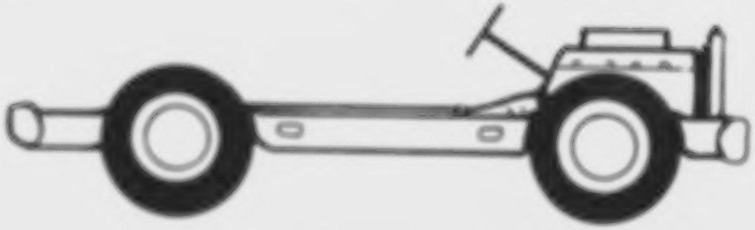
   (NOTE: This contest is open to FFA members only, who speak on an FFA- or agriculture-related subject.)

What Is an Outline?

A Skeleton —



or a Frame —



An outline forms the framework of a speech.

Principal Parts of an Outline

I. INTRODUCTION: Arouses interest in you and indicates your appreciation of the audience.

II. BODY: Develops the main idea; lets the audience know what they are to hear and prepares them for good listening.

III. CONCLUSION: Summarizes, reviews, urges action, or gains respect for ideas expressed.

What Should an Outline Look Like?

I. INTRODUCTION

II. BODY

- A. First main point
    1. Subpoint #1
    2. Subpoint #2
- B. Second main point
    1. Subpoint #1
    2. Subpoint #2

III. CONCLUSION

Topical Outline Style

TITLE

Inoculation

I. INTRODUCTION

Importance of inoculation

II. BODY

A. First main point

Selecting inoculant

1. Subpoint #1
2. Subpoint #2

B. Second main point

Formation of nodules

1. Subpoint #1
2. Subpoint #2

III. CONCLUSION

Healthy and vigorous plant

Sentence Outline Style

TITLE

To Inoculate or Not to Inoculate? That Is the Question!

I. INTRODUCTION

Inoculation of legume seeds is an important part of growing legumes. Start with the inoculation and end with a successful plant stand.

II. BODY

A. First main point

The initial inoculation requires selecting the correct inoculant for the specific legume.

1. Subpoint #1
2. Subpoint #2

B. Second main point

After the seed is planted and a seedling is formed, the inoculate forms nodules in the root system.

1. Subpoint #1
2. Subpoint #2

III. CONCLUSION

The result of a properly inoculated seed is a healthy and vigorous plant.

Judge's Score Sheet

State Public Speaking Contest—Future Farmers of America

Part I for Scoring and Composition			
Items to Be Scored	**Points Allowed**	**Contestants**	
		1	**2**
1. **Content of Manuscript** Importance and appropriateness of subject — Suitability of the material used — Accuracy of the statements included — Evidence of purpose — Completeness and accuracy of bibliography	200		
2. **Composition of Speech — Manuscript** Organization of content — Language used — Unity of thought — Sentence structure — Logical development — Accomplishment of purpose	100		
Items to Be Scored	**Points Allowed**		
1. **Voice Quality** Pitch — Articulation — Force — Pronunciation	100		
2. a. **Stage Presence** Attitude — Poise and body posture — Confidence — Ease before audience — Personality	50		
b. **Personal Appearance** Official FFA dress	50		
3. **Power of Expression** Fluency — Directness — Emphasis — Communicative ability — Sincerity — Conveyance of thought and meaning	200		
4. **Response to Questions** Ability to satisfactorily answer the questions on the speech that are asked by the judges indicating originality, familiarity with subject, and ability to think quickly	200		
5. **General effect** Extent to which the speech was interesting, understandable, convincing, pleasing, and captivating	100		
Total	1000		
Less time each minute	20		
Grand Totals			
Numerical or Final Placing of Contestants			

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WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

INFORMATION SHEET

I. Terms and definitions associated with writing and evaluating speeches

   A. Speech — The communication or expression of thoughts in spoken words

   B. Communication — Two-way process of speaking and listening

   C. *Reader's Guide to Periodical Literature* — Monthly publication that identifies current magazine articles

   (NOTE: The *Reader's Guide to Periodical Literature* may be found in most public libraries.)

   D. Quotation — Statement in which another person's words are cited exactly

   E. Statistics — Data in the form of facts and figures

   F. Gesture — Facial expression or body motion used to emphasize an idea (Figures 1 and 2)

   EXAMPLES:

FIGURE 1

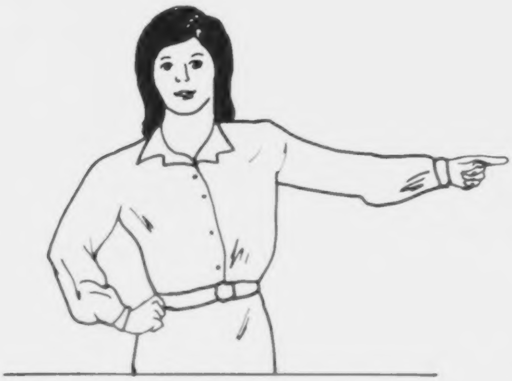
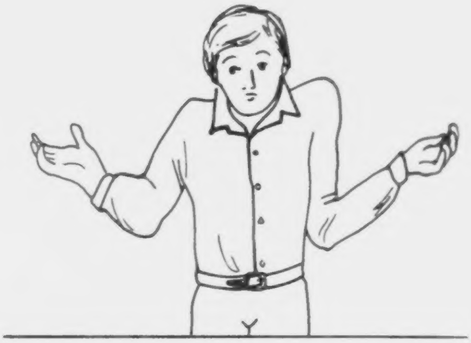


FIGURE 2



   G. Articulate — To talk distinctly

   H. Pronunciate — To pronounce words correctly

   I. Attitude — Position assumed for a specific purpose

   J. Poise — Easy, self-possessed assurance of manner

   K. Fluency — Quality of being effortlessly smooth and rapid; polished

INFORMATION SHEET

II. Phases of communication and their definitions

   A. Speaking — Using verbal and nonverbal expression to transmit a message to a receiver for a particular purpose

   (NOTE: The speaker must use effective verbal skills [proper diction, grammar, pronunciation] as well as effective nonverbal skills [visible body movements, facial expressions and gestures, posture] to communicate a message.)

   B. Listening — Receiving, processing, and evaluating verbal and nonverbal message expressed by sender for a particular purpose

   (NOTE: Receiving, processing, and evaluating the speaker's message involves staying alert, resisting distractions, noting nonverbal cues, and concentrating on what the speaker is saying—really hearing the speaker's message.)

III. Guidelines for preparing a successful speech

   A. Choose an idea that is interesting to the audience

   B. Choose an idea that is striking, different, or unusual

   C. Choose information that is current and timely

   D. Make presentation clear to yourself

   (NOTE: Think about logical order.)

   E. Phrase speech clearly for your audience

   F. Explain any new ideas or terms related to subject (topic)

   G. Practice giving your speech

IV. Steps to follow in writing a speech

   A. Select a familiar subject

   B. Research available references

   C. Record key information

   EXAMPLE: Write on 3×5 cards

   D. Develop an outline

   E. Write a rough draft

   F. Revise rough draft

   G. Type or print the final copy

INFORMATION SHEET

V. Guidelines to follow when gathering information for a speech

(NOTE: Background information is available for the person who will look for it. The following list includes only a few reference possibilities.)

A. Check personal books

B. Review back issues of trade and business magazines

EXAMPLES: *Hoard's Dairyman, National Pork Producers, The Cattleman, Farm Journal, Farmer-Stockman*

C. Check school and public libraries

D. Use *Reader's Guide to Periodical Literature* to locate magazine articles

E. Write to associations

EXAMPLES: Oklahoma Cattlemen's Association, Oklahoma Pork Commission, Oklahoma Sheep Grower's Association, Oklahoma Wheat Grower's Association, Oklahoma Peanut Commission

F. Interview a resource person

EXAMPLES: President of a civic club, farmer or rancher, owner of feedstore

G. Contact appropriate federal, state, or county government agencies

EXAMPLES: County Extension Office, United States Department of Agriculture, County Soil Conservation Office, State Department of Agriculture

H. Check educational facilities and their publications

EXAMPLES: Oklahoma State University, *OSU Extension Fact Sheets*

I. Check newspapers

(NOTE: Many newspaper farm editors have very useful information.)

VI. Rules for using quotations and statistics in a speech

A. Use only when needed to make a point

(NOTE: Limit the use of quotations in your speech; the audience wants to hear your opinions, not another author's opinions.)

B. Make sure the source and date of information are accurate

(NOTE: It is common courtesy to cite the author's name, and doing so often helps support your information.)

C. Keep the true meaning of the quotations and statistics

(NOTE: Use quotations and statistics in their original context.)

INFORMATION SHEET

VII. Reasons for using outlines

A. To help you recognize the speech's strengths and weaknesses

B. To help you in organizing and developing your ideas

C. To help you save time when writing the speech

VIII. Principal parts of an outline and their definitions

A. Introduction — Beginning of speech; should attract and motivate audience

(NOTE: The introduction to a speech should get the audience's attention, state the purpose, relate the importance of the topic to the audience, and preview the main points to be covered.)

B. Body — Central theme of speech; carries main ideas

(NOTE: The body of a speech carries the speaker's message. It consists of the main points, subdivisions, and supporting detail. Its main objective is to develop fully the theme of your presentation.)

C. Conclusion — End of speech; reviews or summarizes main points of speech, or asks for action

(NOTE: The end of a speech is just as important as the beginning and must be accorded its proper allotment of preparation. Your conclusion must do two things: give your audience a feeling of completeness or satisfaction in terms of your having done what you set out to do, and center attention on the whole idea of your speech rather than on any part of it. In short, it must drive home the central message of the speech.)

IX. Types of outlines and their definitions

A. Topical — Outline style using key words or phrases to express the order of the thoughts to be presented in a speech (See Figure 3)

B. Sentence — Outline style using complete sentences to express the order of the thoughts to be presented in a speech

(NOTE: The sentence outline is more complete and therefore usually a better outline style for beginning speakers to use. See Figure 4.)

EXAMPLES:

FIGURE 3: Topical outline style

TITLE

Inoculation

I. **INTRODUCTION**

Importance of inoculation

II. **BODY**

A. **First main point**

Selecting inoculant

1. Subpoint #1
2. Subpoint #2

B. **Second main point**

Formation of nodules

1. Subpoint #1
2. Subpoint #2

III. **CONCLUSION**

Healthy and vigorous plant

FIGURE 4: Sentence outline style

TITLE

To Inoculate or Not to Inoculate? That Is the Question!

I. **INTRODUCTION**

Inoculation of legume seeds is an important part of growing legumes. Start with the inoculation and end with a successful plant stand.

II. **BODY**

A. **First main point**

The initial inoculation requires selecting the correct inoculant for the specific legume.

1. Subpoint #1
2. Subpoint #2

B. **Second main point**

After the seed is planted and a seedling is formed, the inoculate forms nodules in the root system.

1. Subpoint #1
2. Subpoint #2

III. **CONCLUSION**

The result of a properly inoculated seed is a healthy and vigorous plant.

X. Ways to develop proper delivery

A. Practice speech in front of mirror

B. Use tape or video recorder for evaluating delivery

C. Practice giving speech in front of another person

INFORMATION SHEET

XI. Ways to develop and add meaning to the delivery of a speech

- A. Maintain eye contact
- B. Gesture

  EXAMPLES: Use your hands; vary facial expression

  (NOTE: Be yourself, but do not overact. Overacting focuses the audience's attention on the speaker, not on the speech.)

- C. Maintain good posture
- D. Move around
- E. Use voice control

XII. Reasons for using gestures when giving a speech

- A. To emphasize specific thoughts
- B. To convey attitudes or moods
- C. To express thoughts and feelings

XIII. Ways to make a good impression when delivering a speech

- A. Be neatly groomed
- B. Be prepared

  (NOTE: The best way to be prepared is to practice your speech until you know it well and can deliver it smoothly.)

- C. Let all important actions and gestures be seen clearly
- D. Be enthusiastic and confident
- E. Recognize that some fear is normal; do not get too upset
- F. Speak clearly and in a pleasant tone of voice

XIV. Factors to consider when listening to and evaluating a speech

- A. Content of speech
  1. Important and appropriate subject
  2. Suitable materials
  3. Accurate statements included
  4. Evidence of purpose

INFORMATION SHEET

B. Composition of speech
    1. Clear organization of content
    2. Appropriate language
    3. Unity of thought
    4. Proper sentence structure
    5. Logical development
    6. Accomplishment of purpose

C. Speaker's voice quality
    1. Proper pitch
    2. Proper articulation
    3. Proper force
    4. Proper pronunciation

D. Speaker's stage presence
    1. Appropriate attitude
    2. Good poise and body posture
    3. Ease before audience
    4. Appropriate personality

E. Speaker's personal appearance
    1. Neat appearance
    2. Appropriate dress

F. Speaker's power of expression
    1. Fluent
    2. Direct
    3. Proper emphasis
    4. Good communicative ability
    5. Sincere
    6. Good conveyance of thought and meaning

G. Speaker's response to questions — Answers reflect speaker's originality, familiarity with subject, and ability to think quickly

H. General effect of speech — Speech was interesting, understandable, convincing, pleasing, and captivating

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

ASSIGNMENT SHEET #1 — SELECT A SPEECH TOPIC AND GATHER INFORMATION FOR A SIX- TO EIGHT-MINUTE SPEECH

NAME ______________________________ SCORE ______________

Perhaps the most difficult part of writing a speech is getting started—selecting a topic and gathering information on that topic. In this assignment sheet you will be guided through these two "getting started" phases of speech writing.

PART I: Selecting a speech topic

When selecting a topic for a speech, you should choose a subject that is familiar and interesting to you. Since most vocational agriculture students are interested in FFA- or agriculture-related subjects, the following list of speech contests available to FFA members would probably be a good starting place to help you select a speech topic. Study this list carefully and then follow the directions in Sections A and B.

SPEECH CONTESTS OPEN TO FFA MEMBERS IN OKLAHOMA

FFA-sponsored speech contests

- Prepared Public Speaking Contest

  (NOTE: A speech for this contest must be on an FFA- or agriculture-related subject. The winner of the state contest participates in a subregional contest. The top two speakers from each subregional contest participate in a regional contest, and the winner from each regional contest participates in the national contest.)

- Extemporaneous Public Speaking Contest

  (NOTE: The contestants at this contest draw three topics and then choose the topic they wish to speak on from one of those three. Each contestant is allowed thirty minutes to prepare a three- to five-minute speech. The contestants present their speeches and then must answer questions put to them by the contest judges. The winner of the state contest participates in a subregional contest. The top two speakers in each subregional contest participate in a regional contest, and the winner from each regional contest participates in the national contest.)

- Soil-Conservation Speech Contest

  (NOTE: The topics for this contest must be related to soil-conservation techniques and modern soil- and water-conservation practices.)

- Bankers Speech Contest

  (NOTE: Topics for this contest must be about the relationship between banking and agriculture.)

- Greenhand Public Speaking Contest

  (NOTE: This contest is for freshman FFA members only, and the speech topic must be on a FFA- or agriculture-related subject.)

ASSIGNMENT SHEET #1

- Dairy Speech Contest

  (NOTE: Topics for this contest must be on some type of dairy product and its promotion.)

- Co-Op Speech Contest

  (NOTE: Topics for this contest may be on any subject related to agricultural cooperatives.)

- Animal Science Public Speaking Contest

  (NOTE: Every year prior to the contest, Oklahoma State University's Animal Science Department announces a new topic for this contest.)

- Creed Speaking Contest

  (NOTE: This contest, for freshmen only, consists of speakers reciting the FFA Creed.)

Non-FFA-sponsored speech contests

(NOTE: The following contests have their own rules, and winners advance to the state level only.)

- State Fair Speech Contests

  (NOTE: FFA members only compete in one of the contests held in Oklahoma City, Tulsa, or Muskogee. Speeches must be on an FFA- or agriculture-related subject.)

- Farmers Union Public Speaking Contest

  (NOTE: This contest is open to FFA members and to members of several other organizations.)

- Young Farmers Speech Contest

  (NOTE: This contest is open to FFA members only, who speak on an FFA- or agriculture-related subject.)

A. On the blank line below, record the name of one speech contest you would be interested in entering.

____

B. On the blank line below, record the topic of the speech you would like to write to qualify for that speech contest.

____

PART B: Gathering information

Gathering information to develop your speech topic consists of two stages: (1) selecting possible reference materials and (2) recording key information from those references. To help you through these stages, follow the directions and complete Sections A and B.

ASSIGNMENT SHEET #1

A. Reread Section V of the information sheet, concerning guidelines to follow when gathering information for a speech, and then list possible references that may help you in finding background information to develop your speech topic. List those reference sources on the blanks below.

Possible reference sources:

____

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ASSIGNMENT SHEET #1

B. Recording key information from your references

Recording key information from your resource material (note-taking) involves quoting another person's thoughts or summarizing another person's thoughts in your own words in such a way that the idea is clear to you and the original thought has not been distorted.

Read the following guidelines for recording information, and then, using the sources you listed in Section A, take notes to help you develop your speech topic. Hand in your notes to your instructor for evaluation.

Guidelines for recording information

- Record information on 3×5 cards.
- If you are in doubt about whether or not to take a note, take it. It is easier to discard a note you do not need than to relocate a source.
- Summarize information in your own words without distorting the original thought.
- Do not copy information word-for-word from the original unless your source concisely sums up a great deal of information and you want to incorporate that quotation into your speech.
- If you copy a quotation, make sure you enclose it in quotation marks so later you will know that the note was quoted verbatim.
- Cite on each card the source and date of the information you have recorded.

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

ASSIGNMENT SHEET #2 — WRITE AN OUTLINE FOR A SIX- TO EIGHT-MINUTE SPEECH

NAME ______________________________ SCORE ______________

After gathering information from available sources, the next step in developing a speech is to make an outline. After you have reviewed the notes you took over your reference material, outline your speech, using the space below. Use either the topic or sentence outline style discussed in Section IX of the information sheet. Have your instructor evaluate the completed outline.

TITLE

____

I. **INTRODUCTION**

____

____

II. **BODY**

A. **First main point**

____

____

1. Subpoint #1

____

____

2. Subpoint #2

____

____

B. **Second main point**

____

____

ASSIGNMENT SHEET #2

1. Subpoint #1

____

____

2. Subpoint #2

____

____

III. **CONCLUSION**

____

____

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

ASSIGNMENT SHEET #3 — WRITE AN INTRODUCTION FOR A SIX- TO EIGHT-MINUTE SPEECH

NAME ______________________________ SCORE ____________

The introduction sets the stage for your speech. Select your words carefully. The introduction should be written in such a manner that the audience can identify with your speech. Make your sentences have meaning.

Using the outline you developed in Assignment Sheet #2, write the introduction to your speech. You may use the space below for your introduction. If more space is needed, use the back of this page. Have your instructor evaluate your completed introduction.

Speech title: ______________________________

Introduction: ______________________________

ASSIGNMENT SHEET #3

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

ASSIGNMENT SHEET #4 — WRITE THE BODY OF A SIX- TO EIGHT-MINUTE SPEECH

NAME ________________________ SCORE ____________

The body of your speech is the heart of the speech. This part should be filled with useful information. The speech should flow from one point to another. Use words that have meaning and words that you feel comfortable using. If you use dates and figures, make sure that the sources are given.

A considerable amount of time should go into preparing this part of your speech. Using the outline you prepared in Assignment Sheet #2, write the body of your speech. Use the following pages for writing your speech. Read through your speech and make modifications as needed. Have your instructor evaluate the completed body of your speech.

Speech title: ________________________

Body: ________________________

ASSIGNMENT SHEET #4

ASSIGNMENT SHEET #4

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

ASSIGNMENT SHEET #5 — WRITE THE CONCLUSION OF A SIX- TO EIGHT-MINUTE SPEECH

NAME ________________________________ SCORE ______________

The conclusion should be short and closely tied to the text of your speech. The conclusion should summarize the key points of your speech and call for action if appropriate.

Using the outline you developed in Assignment Sheet #2, write the conclusion to your speech. Use the space below to write your conclusion. If more space is needed, continue on the back of this page. Have your instructor evaluate your completed conclusion.

Speech title: ____

Conclusion: ____

ASSIGNMENT SHEET #5

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

ASSIGNMENT SHEET #6 — GIVE A SIX- TO EIGHT-MINUTE SPEECH

NAME ______________________________ SCORE ______________

The time has arrived for you to prepare the final draft of your speech. Use Assignment Sheets #3, #4, and #5 as your rough draft. Rewrite your speech, making the introduction, body, and conclusion fit together. Review the speech closely to make sure that it flows. Rework any unfavorable words or incomplete statements.

The following points may assist you.

- Study and restudy your speech. Make sure that you know your speech; memorize it if necessary.

  (NOTE: A good way to memorize your speech is by reading it aloud several times.)

- Practice your speech in front of a mirror. This will allow you to practice the use of gestures.

- Tape or video record your speech and play it back. This will give you an opportunity to hear how you sound or to see and hear how you deliver your speech.

Now that you have studied your speech, you are ready to deliver your speech. The following information will assist you in your delivery.

- Be neatly groomed.

- Be prepared.

- Maintain eye contact.

- Gesture.

- Maintain good posture.

- Move around.

- Let all important actions or gestures be seen clearly.

- Recognize that some fear is normal.

- Speak clearly and in a pleasant tone of voice; use voice control.

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

ASSIGNMENT SHEET #7 — EVALUATE ANOTHER STUDENT'S SPEECH

NAME ______________________________ SCORE ______________

In Section XIV of the information sheet, you studied the factors to consider when listening to and evaluating a speech. The items listed in the information sheet were based on the score sheet used by the judges at Oklahoma's official FFA public speaking contests. That score sheet has been reprinted for you at the end of this assignment sheet. In this assignment sheet, you will use the official speech-rating sheet to evaluate another student's speech. But, remember, evaluating someone else will also assist you in evaluating your own speeches.

Study the official judge's score sheet at the end of this assignment sheet, and then read Part I of the assignment sheet below. Evaluate another student's speech by filling in the score sheet and by following the directions in Part I. Have your instructor evaluate your completed assignment sheet.

Part I: Speech identification data

A. Record the speaker's name on the blank line below.

____

B. Record the title of the speech on the blank line below.

____

C. List the main point(s) the speaker made in the introduction to the speech.

____

____

____

D. List the main points the speaker made in the body of the speech.

____

____

____

____

E. List the main point(s) the speaker made in the conclusion of the speech.

____

____

____

ASSIGNMENT SHEET #7

F. Briefly state the topic of the speech on the lines below.

G. Briefly discuss the speaker's voice quality. (Was his or her voice forceful enough? Was his or her pitch pleasing? Did he or she articulate clearly and pronunciate correctly?)

H. Discuss the speaker's stage presence and personal appearance. (Was he or she confident, poised, and at ease before the audience?)

I. Briefly discuss the speaker's power of expression. (How fluent was he or she? Did he or she convey the thought and meaning intended? Did she or he seem sincere?)

J. Briefly discuss the speaker's ability to answer questions on the speech.

K. Discuss the general effect of the speech upon the audience.

ASSIGNMENT SHEET #7

PART B: Judge's score sheet — State public speaking contest — Future Farmers of America

Part I for Scoring and Composition

Items to Be Scored	Points Allowed	Contestants	
		1	2
1. **Content of Manuscript** Importance and appropriateness of subject — Suitability of the material used — Accuracy of the statements included — Evidence of purpose — Completeness and accuracy of bibliography	200		
2. **Composition of Speech — Manuscript** Organization of content — Language used — Unity of thought — Sentence structure — Logical development — Accomplishment of purpose	100		
Items to Be Scored	**Points Allowed**		
1. **Voice Quality** Pitch — Articulation — Force — Pronunciation	100		
2. a. **Stage Presence** Attitude — Poise and body posture — Confidence — Ease before audience — Personality	50		
b. **Personal Appearance** Official FFA dress	50		
3. **Power of Expression** Fluency — Directness — Emphasis — Communicative ability — Sincerity — Conveyance of thought and meaning	200		
4. **Response to Questions** Ability to satisfactorily answer the questions on the speech that are asked by the judges indicating originality, familiarity with subject, and ability to think quickly	200		
5. **General effect** Extent to which the speech was interesting, understandable, convincing, pleasing, and captivating	100		
Total	1000		
Loss time each minute	20		
Grand Totals			
Numerical or Final Placing of Contestants			

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WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

ASSIGNMENT SHEET #8 — FILL OUT A CONTESTANT'S CERTIFICATION FORM

NAME ____ SCORE ________________

In order to enter your speech in an FFA public-speaking contest, you must first fill out and sign a contestant's certification form. In addition, your local FFA advisor must sign the form before you submit your speech. The form below is a duplicate of the contestant's certification form used by the FFA. Complete the form so that you can submit the speech you have written and given in your classroom. Hand in the completed form to your instructor for evaluation.

CONTESTANT'S CERTIFICATION

FUTURE FARMERS OF AMERICA — PUBLIC SPEAKING CONTESTS

I hereby certify that I meet all the eligibility requirements for participation in the state FFA public speaking contests for the current year as set forth by the boards of student officers and directors. My speech entitled,

____

in the ____________________ division is the result of my own effort and ability. It is understood that I am encouraged to utilize all available training facilities of my local school in developing my speaking abilities and that I may obtain facts and working data from any source. However, if in securing information such as direct quotes or phrases, specific dates, figures, or other materials, such must be marked in "quotes" in the manuscript and are identified in the bibliography at the end of the manuscript. Failure to do so represents plagiarism and will automatically lead to my disqualification.

DATE: ____________________ SIGNED: ______________________________________
(Contestant's Full Signature)

APPROVED: ____________________
(Local Advisor)

IMPORTANT: This form must accompany four, double-spaced, typewritten copies of your speech to the person in charge of the district or state public speaking contests.

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WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1 — Evaluated to the satisfaction of the instructor

Assignment Sheet #2 — Evaluated to the satisfaction of the instructor

Assignment Sheet #3 — Evaluated to the satisfaction of the instructor

Assignment Sheet #4 — Evaluated to the satisfaction of the instructor

Assignment Sheet #5 — Evaluated to the satisfaction of the instructor

Assignment Sheet #6 — Evaluated to the satisfaction of the instructor

Assignment Sheet #7 — Evaluated to the satisfaction of the instructor

Assignment Sheet #8 — Evaluated to the satisfaction of the instructor

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

TEST

NAME ________________________________ SCORE ______________

1. Match to their correct definitions terms associated with writing and evaluating speeches. Write the correct numbers in the blanks.

_____a. Easy, self-possessed assurance of manner

_____b. The communication or expression of thoughts in spoken words

_____c. Position assumed for a specific purpose

_____d. Facial expression or body motion used to emphasize an idea

_____e. Statement in which another person's words are cited exactly

_____f. Two-way process of speaking and listening

_____g. To talk distinctly

_____h. To pronounce words correctly

_____i. Data in the form of facts and figures

_____j. Quality of being effortlessly smooth and rapid; polished

_____k. Monthly publication that identifies current magazine articles

1. Speech
2. Communication
3. *Reader's Guide to Periodical Literature*
4. Quotation
5. Statistics
6. Gesture
7. Articulate
8. Pronunciate
9. Attitude
10. Fluency
11. Poise

2. Match the phases of communication to their correct definitions. Write the correct numbers in the blanks.

_____a. Using verbal and nonverbal expression to transmit a message to a receiver for a particular purpose

_____b. Receiving, processing, and evaluating verbal and nonverbal message expressed by sender for a particular purpose

1. Speaking
2. Listening

TEST

3. Select from the following list guidelines for preparing a successful speech. Write an "X" in the blank before each correct answer.

_____a. Choose an idea that is interesting to the audience

_____b. Speak quietly, but quickly, to finish on time

_____c. Explain any new ideas or terms related to the subject (topic)

_____d. Phrase speech clearly for your audience

_____e. Use technical terms

_____f. Speak in a flat voice to be clearly understood

_____g. Make presentation clear to yourself

_____h. Choose information that is at least one year old

_____i. Practice giving your speech

_____j. Choose an idea that is striking, different, or unusual

4. Arrange in order steps to follow in writing a speech. Write a "1" in the blank before the first step, a "2" in the blank before the second step, and so on.

_____a. Record key information

_____b. Develop an outline

_____c. Research available references

_____d. Select a familiar subject

_____e. Type or print the final copy

_____f. Revise rough draft

_____g. Write a rough draft

5. Select from the following list guidelines to follow when gathering information for a speech. Write an "X" in the blank before each correct answer.

_____a. Use *Reader's Guide to Periodical Literature* to locate magazine articles

_____b. Check personal books

_____c. Check school and public libraries

TEST

______d. Check newspapers

______e. Review back issues of trade and business magazines

______f. Contact appropriate federal, state, or county government agencies

______g. Write to associations

______h. Interview a resource person

______i. Check educational facilities and their publications

6. State rules for using quotations and statistics in a speech.

a. ____

b. ____

c. ____

7. Discuss reasons for using outlines.

____

____

____

8. Match principal parts of an outline to their correct definitions. Write the correct numbers in the blanks.

______a. End of speech; reviews or summarizes main points of speech, or asks for action

______b. Central theme of speech; carries main ideas

______c. Beginning of speech; should attract and motivate audience

1. Introduction
2. Body
3. Conclusion

9. Define type of outlines.

a. Topical — ____

____

b. Sentence — ____

____

TEST

10. State ways to develop proper delivery.

a. ____

b. ____

c. ____

11. Select from the following list ways to develop and add meaning to the delivery of a speech. Write an "X" in the blank before each correct answer.

______a. Maintain eye contact

______b. Dress properly

______c. Gesture

______d. Maintain good posture

______e. Move around

______f. Use technical terms

______g. Use voice control

12. State reasons for using gestures when giving a speech.

a. ____

b. ____

c. ____

13. State four ways to make a good impression when delivering a speech.

a. ____

b. ____

c. ____

d. ____

14. List factors to consider when listening to and evaluating a speech.

Content of speech (List two.)

a. ____

b. ____

TEST

Composition of speech (List threee.)

a. ______________________________

b. ______________________________

c. ______________________________

Speaker's voice quality (List two.)

a. ______________________________

b. ______________________________

Speaker's stage presence (List two.)

a. ______________________________

b. ______________________________

Speaker's personal appearance (List one.) — ______________________________

____

Speaker's power of expression (List three.)

a. ______________________________

b. ______________________________

c. ______________________________

Speaker's response to questions (List one.) — ______________________________

____

General effect of speech (List one.) — ______________________________

____

(NOTE: Test items 15 through 21 list the assignment sheets that are considered an important part of this test. If they have not been completed, check with your instructor.)

15. Select a speech topic and gather information for a six- to eight-minute speech.
16. Write an outline for a six- to eight-minute speech.
17. Write an introduction for a six- to eight-minute speech.
18. Write the body of a six- to eight-minute speech.
19. Write the conclusion of a six- to eight-minute speech.
20. Give a six- to eight-minute speech.
21. Evaluate another student's speech.

WRITE, DELIVER, AND EVALUATE A SPEECH
UNIT I

ANSWERS TO TEST

1. a. 11
   b. 1
   c. 9
   d. 6
   e. 4
   f. 2
   g. 7
   h. 8
   i. 5
   j. 10
   k. 3

2. a. 1
   b. 2

3. a, c, d, g, i, j

4. a. 3
   b. 4
   c. 2
   d. 1
   e. 7
   f. 6
   g. 5

5. a, b, c, d, e, f, g, h, i

6. a. Use only when needed to make a point
   b. Make sure the source and date of information are accurate
   c. Keep the true meaning of the quotations and statistics

7. Discussion should include the following

   a. To help you recognize the speech's strengths and weaknesses
   b. To help you in organizing and developing your ideas
   c. To help you save time when writing the speech

8. a. 3
   b. 2
   c. 1

9. a. Outline style using key words or phrases to express the order of the thoughts to be presented in a speech
   b. Outline style using complete sentences to express the order of the thoughts to be presented in a speech

ANSWERS TO TEST

10. a. Practice speech in front of mirror
    b. Use tape or video recorder for evaluating delivery
    c. Practice giving speech in front of another person

11. a, c, d, e, g

12. a. To emphasize specific thoughts
    b. To convey attitudes or moods
    c. To express thoughts and feelings

13. Answer should include any four of the following

    a. Be neatly groomed
    b. Be prepared
    c. Let all important actions and gestures be seen clearly
    d. Be enthusiastic and confident
    e. Recognize that some fear is normal; do not get too upset
    f. Speak clearly and in a pleasant tone of voice

14. **Content of speech** (Answer should include any two of the following.)

    a. Important and appropriate subject
    b. Suitable materials
    c. Accurate statements included
    d. Evidence of purpose

    Composition of speech (Answer should include any three of the following.)

    a. Clear organization of content
    b. Appropriate language
    c. Unity of thought
    d. Proper sentence structure
    e. Logical development
    f. Accomplishment of purpose

    Speaker's voice quality (Answer should include any two of the following.)

    a. Proper pitch
    b. Proper articulation
    c. Proper force
    d. Proper pronunciation

ANSWERS TO TEST

Speaker's stage presence (Answer should include any two of the following.)

a. Appropriate attitude
b. Good poise and body posture
c. Ease before audience
d. Appropriate personality

Speaker's personal appearance (Answer should include one of the following.)

a. Neat appearance
b. Appropriate dress

Speaker's power of expression (Answer should include any three of the following.)

a. Fluent
b. Direct
c. Proper emphasis
d. Good communicative ability
e. Sincere
f. Good conveyance of thought and meaning

Speaker's response to questions — Answers reflect speaker's originality, familiarity with subject, and ability to think quickly

General effect of speech — Speech was interesting, understandable, convincing, pleasing, and captivating

15. Evaluated to the satisfaction of the instructor

16. Evaluated to the satisfaction of the instructor

17. Evaluated to the satisfaction of the instructor

18. Evaluated to the satisfaction of the instructor

19. Evaluated to the satisfaction of the instructor

20. Evaluated to the satisfaction of the instructor

21. Evaluated to the satisfaction of the instructor

HANDLE FINANCES
UNIT I

UNIT OBJECTIVE

After completing this unit, the student should be able to write checks, fill out deposit slips, reconcile a checking-account statement, and better understand financial terms and the importance of good money management. The student will show this ability by completing the assignment sheets and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with handling finances.
2. State benefits of money management.
3. Select from a list guidelines that promote effective money management.
4. List factors that influence consumer spending.
5. Select from a list functions of financial institutions.
6. Match types of financial institutions to their correct descriptions.
7. State reasons for saving money.
8. Select from a list guidelines for saving money.
9. Match types of saving methods to their correct definitions.
10. Match types of financial instruments to their correct descriptions.
11. Select from a list advantages of a checking account.
12. Name types of checking accounts.
13. Arrange in order steps to take when opening a checking account.
14. Match types of check endorsements to their correct descriptions.
15. State ways to request stop payment on a check.
16. Select from a list points to remember when writing checks.
17. Select from a list points to remember when writing deposit slips.

OBJECTIVE SHEET

18. Select from a list reasons for keeping a check register.
19. State reasons for reconciling a checking-account statement.
20. Arrange in order steps for reconciling a checking-account statement.
21. Develop a savings plan.
22. Write checks.
23. Write deposit slips.
24. Complete a check register.
25. Reconcile a checking-account statement.

HANDLE FINANCES
UNIT II

SUGGESTED ACTIVITIES

I. Unit contents

   A. Objective sheet

   B. Suggested activities

      1. Supplements

         a. Supplement #1 — Complete a Banking Crossword Puzzle

         b. Supplement #2 — How Checks Travel

      2. Transparency masters

         a. TM #1 — Model of the American Economic System

         b. TM #2 — Money: What Does It Mean?

         c. TM #3 — Characteristics of Money

         d. TM #4 — Functions of Money

         e. TM #5 — Signature Card

         f. TM #6 — Blank Personal Check

         g. TM #7 — Completed Personal Check

         h. TM #8 — Checking Account Deposit Slip

         i. TM #9 — Vertical Deposit Slip

         j. TM #10 — Savings Account Deposit Slip

         k. TM #11 — Blank Check Register

         l. TM #12 — Checking Account Statement (Front)

         m. TM #13 — Checking Account Statement (Back)

   C. Information sheet

   D. Assignment sheets

SUGGESTED ACTIVITIES

1. Assignment Sheet #1 — [illegible]
2. Assignment Sheet #2 — Write Checks
3. Assignment Sheet #3 — Write Deposit Slips
4. Assignment Sheet #4 — Complete a Check Register
5. Assignment Sheet #5 — Reconcile a Checking Account Statement

E. Answers to assignment sheets

F. Test

G. Answers to test

II. Instructor's guide

A. Review unit and plan presentation.

B. Obtain materials to supplement unit.

1. Films

(NOTE: The films listed below are available to Oklahoma teachers on a free-loan basis. Oklahoma teachers may order from the Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074. Out-of-state teachers must order from the addresses listed with the films.)

a. *24 Hours in a Life of a Check.* Color, 30 minutes, American Bankers Association, 1971. Available from American Bankers Association, 1120 Connecticut Avenue, NW, Washington, DC 20036.

(NOTE: This film explains how a check is processed round the clock through the many channels in a financial institution.)

b. *Checks: What to Cash.* Color, 15 minutes, BNA Communications, Inc., 1971. Available from BNA Communications, Inc., 9417 Decoverly Hall Road, Rockville, Massachusetts 20850.

(NOTE: This film describes the four general conditions that must be met before one can cash a check with minimum risk of loss.)

c. *Checks: When to Cash.* Color, 15 minutes, BNA Communications, Inc., 1971. Available from BNA Communications, Inc., 9417 Decoverly Hall Road, Rockville, Massachusetts 20850.

(NOTE: This film reviews the conditions for cashing a check, along with five transactions showing a typical check-cashing swindle.)

SUGGESTED ACTIVITIES

2. Booklets

   a. *The Story of Checks*. Available from Federal Reserve Bank of New York, Public Information Department, 33 Liberty Street, New York, New York 10045.

      (NOTE: This booklet is designed in comic-book form and contains stories on how checking began, the Federal Reserve System, and the movement of checks through the Federal Reserve System.)

   b. *Banking Is—Student Study Guide*. Available from National Learning Productions, Inc., 505 6th Avenue, P.O. Box 246, St. Albans, West Virgina 25177.

      (NOTE: This booklet contains sections on banking and the economy, savings, checking accounts, lending, and other services for the convenience and protection of the customer. It also contains exercises in budgeting, check writing, filling out a check register, and reconciling a checking-account statement. This company also makes available *Banking Is—Checkset*, an exercise in check writing, depositing, and account reconciliation. *Checkset* includes blank checks, deposit slips, check register, checking-account statements, and a reconcilement worksheet.)

   c. *Checkbook Management*. Available from Bankers Systems, Inc., St. Cloud, Minnesota 56301.

      (NOTE: This pocket-size booklet contains tips on managing your checkbook. The booklet is often available through local financial institutions.)

3. Book—*Bank Reconciliation Projects*, by Robert J. McCullough and Kenneth E. Everard. Available from Fearon Pitman Publishers, Inc., 6 Davis Drive, Belmont, California 94002.

   (NOTE: This book contains projects on opening a checking account, handling checks, interpreting the checking-account statement, and preparing a reconciliation statement.)

4. Packet—*Security First Bank: A Banking Customer Simulation*, by Patsy Hall Sargent and Mary Faye Ward. Available from South-Western Publishing Company, Cincinnati, Ohio.

   (NOTE: This packet contains a checkbook and register, deposit slips, file envelopes, and a booklet that includes exercises in aligning decimals, performing simple addition and subtraction, writing amounts in numerals and words, writing deposit slips, writing checks, and reconciling a checkbook.)

SUGGESTED ACTIVITIES

5. Copies of fee schedules for financial services including checking and savings accounts and sample copies of financial instruments used by your local financial institutions

   (NOTE: Visit your local financial institutions and obtain copies of these items.)

6. Transparencies and compentency profiles

   (NOTE: Transparencies and competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Introduce unit.

SUGGESTIONS:

- Point out that students are probably just beginning to think about their futures—they are planning to go to work, to college, to vo-tech school, or to return to the farm after high school graduation. Since they are mapping out plans for their future careers, they should also begin to think about their financial future.

- Explain that the student's financial well-being in the years ahead depends on the following factors: trends in the national and state economies, the rate of inflation, the cost of money, and the student's own attitude towards working and earning a living. The student's willingness to work hard, show initiative, and have confidence in his or her talents and abilities are the key factors in future earning power.

- Emphasize that this unit on handling finances is important to each student's future financial picture, because no matter how much money he or she may earn, any amount will never be enough to satisfy financial needs if it is not spent wisely. In this unit, students will learn the proper way to save money and even spend money. They will also learn some things about financial institutions, the finance industry, and financial services. Learning about the finance industry puts the student a giant step ahead of others who may not have had this opportunity. It is important that the student know how the industry functions and how his or her financial picture can improve by using the services local financial institutions offer.

- Use Transparency #1 to illustrate your discussion of how the American economic system operates.

D. Provide students with objective sheet, and discuss unit and specific objectives, stressing that the major thrust of this unit is for the students to be able to write checks and deposits, complete a check register, and reconcile a checking-account statement.

SUGGESTED ACTIVITIES

E. Provide students with information and assignment sheets.

F. Discuss information and assignment sheets.

1. Use Information Sheet, Section I to discuss terms and definitions associated with handling finances.

   SUGGESTIONS:

   - Stress to students the importance of understanding words used frequently when discussing finances.
   - Use Supplement #1 to encourage students' understanding of the terms used in banking.

2. Use Information Sheet, Section II to discuss the benefits of money management.

   SUGGESTIONS:

   - Use Transparency #2 to illustrate your discussion of what gives money value.
   - Use Transparency #3 to illustrate your discussion of the characteristics of money.
   - Use Transparency #4 to illustrate your discussion of the function of money.
   - Ask students to compare how they spend money they have earned versus how they spend money that has been given to them. Have students list the things they would buy or the things they would do if they were given $1000. Save these lists for comparison with the lists the students will make after they complete Assignment Sheet #1.

3. Use Information Sheet, Section III to discuss guidelines that promote effective money management.

   SUGGESTIONS:

   - Combine the guidelines presented in the information sheet with a discussion of key economic concepts to stress the important role of money management in making the most of one's money and in avoiding financial problems. For example, discuss the law of sacrifice—to satisfy your most important wants with money that you have to spend, you must make careful choices; the concept of opportunity costs—the price of meeting one goal is the inability to meet another goal; and the concept of inflation—as prices go up, the value of your dollar goes down, and if your income does not rise at the same rate prices rise, your buying power will be reduced.

SUGGESTED ACTIVITIES

- Use Transparencies #1 through #4 to illustrate your discussion.

4. Use Information Sheet, Section IV to help students relate realistically to factors that influence consumer spending and money management.

   SUGGESTION:

   - Ask students to list four or five recent purchases made by them or their families. Call on students to tell how these purchases reflect on farm business or family goals.

5. Use Information Sheet, Section V to discuss the functions of financial institutions.

   SUGGESTIONS:

   - Provide fee schedules for financial services from local financial institutions. Discuss services provided and differences in fees charged for various services.

   - Tour a local financial institution. Locate deposit slips, tellers, and customer services.

   - Invite representatives from local financial institutions to address the class on the topic of "Why You Should Bank with Us." Also have these representatives focus on questions such as why don't all financial institutions offer the same services at the same cost? What kind of restrictions do the federal and state governments place on financial institutions and why? How will financial institutions of twenty-five years from now differ from those of today?

6. Use Information Sheet, Section VI to discuss types of financial institutions and their descriptions.

   SUGGESTION:

   - Have students list the types of financial institutions located in their local community or county.

7. Use Information Sheet, Sections VII, VIII, and IX to discuss saving money.

   SUGGESTIONS:

   - Have students survey local financial institutions to find out the types of savings methods offered.

SUGGESTED ACTIVITIES

- Discuss Assignment Sheet #1. You may also want to provide an assortment of catalogs for students to use when completing this assignment sheet, or you may want to ask students to bring catalogs in to the class. Help students realize the difficulty of determining what is a *need* or *want* and how easy it is to classify too many things as *needs*.

- Have students complete Assignment Sheet #1.

8. Use Information Sheet, Section X to discuss types of financial instruments and their descriptions.

   SUGGESTION:

   - Prepare a bulletin-board display of the financial instruments you have gathered from local financial institutions, or have students obtain samples of the various financial instruments.

9. Use Information Sheet, Section XI to discuss the advantages of a checking account.

   SUGGESTIONS:

   - Show the film *24 Hours in a Life of a Check*.

   - Have students read *The Story of Checks*.

   - Use Supplement #2 to illustrate a discussion of how checks travel, and then have students make a bulletin-board display related to the uses of checks or how checks travel.

10. Use Information Sheet, Section XII to discuss the types of checking accounts.

    SUGGESTION:

    - Have students survey their local financial institutions to determine the types of checking accounts that are offered.

11. Use Information Sheet, Section XIII to discuss the steps to take when opening a checking account.

    SUGGESTIONS:

    - Use Transparency #5 to illustrate how to fill out a signature card, and then have students practice completing a signature card.

    - Invite a representative of a financial institution to discuss the steps to opening a checking account.

SUGGESTED ACTIVITIES

12. Use Information Sheet, Sections XIV and XV to discuss the types of check endorsements and the ways to stop payment on a check.

    SUGGESTIONS:

    - Obtain checks from local financial institutions and have students practice endorsing checks.
    - Show the films *Checks: What to Cash* and *Checks: When to Cash.*

13. Use Information Sheet, Section XVI to discuss points to remember when writing checks.

    SUGGESTIONS:

    - Use Transparencies #6 and #7 to illustrate the parts of a check and the appearance of a properly completed check.
    - Obtain sample checks from a local financial institution or *Banking Is—Checkset* to give students practice in writing checks.
    - Discuss Assignment Sheet #2.
    - Have students complete Assignment Sheet #2.

14. Use Information Sheet, Section XVII to discuss points to remember when writing deposit slips.

    SUGGESTIONS:

    - Use Transparencies #8, #9, and #10 to illustrate checking-account and savings-account deposit slips. You may also want to create a transparency of the back side of a deposit slip to further illustrate your discussion.
    - Have students practice writing deposit slips on sample checking- and savings-account deposit slips you have obtained from local financial institutions or from *Banking Is—Checkset.*
    - Discuss Assignment Sheet #3.
    - Have students complete Assignment Sheet #3.

15. Use Information Sheet, Section XVIII to discuss reasons for keeping a check register.

    SUGGESTIONS:

    - Use Transparency #11 to illustrate your discussion of how to complete a check register. You may also want to create a transparency to illustrate how to use the check stubs in some checkbooks as a check register.

SUGGESTED ACTIVITIES

- Discuss Assignment Sheet #4. Be sure to have students return to Assignment Sheets #2 and #3 for checks and deposit slips to be used in this assignment sheet.
- Have students complete Assignment Sheet #4.

16. Use Information Sheet, Sections XIX and XX to discuss reconciling a checking-account statement.

    SUGGESTIONS:

    - Use Transparencies #12 and #13 to illustrate a checking-account statement. Point out to students that financial institutions will usually issue checking-account statements each month.
    - Discuss Assignment Sheet #5. Tell students to refer to Section XX of the Information Sheet when completing Part I and to Assignment Sheet #4 when completing Part II.
    - Have students complete Assignment Sheet #5.

17. Use exercises from *Banking Is—Checkset*, *Bank Reconciliation Projects*, or *Security First Bank: A Banking Customer Simulation* for those students who need or desire additional practice using financial instruments.

G. Give test.

H. Critique test and discuss in class.

I. Reteach and retest as necessary.

J. Complete appropriate section of competency profiles.

III. Unit references

A. Braker, Pete. *Vocational Agriculture II*, rev. ed. Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1975.

B. Eacret, T., et. al. *English II*, rev. ed. Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1983.

C. Kates, Donna. *Consumer Education*. Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1983.

SUGGESTED ACTIVITIES

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E. Steward, Jim. *Farm Business Management Volume I*, rev. ed. Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1984.

SUGGESTED ACTIVITIES

SUPPLEMENT #1 — COMPLETE A BANKING CROSSWORD PUZZLE

Use the banking clues below to complete the crossword puzzle on the following page.

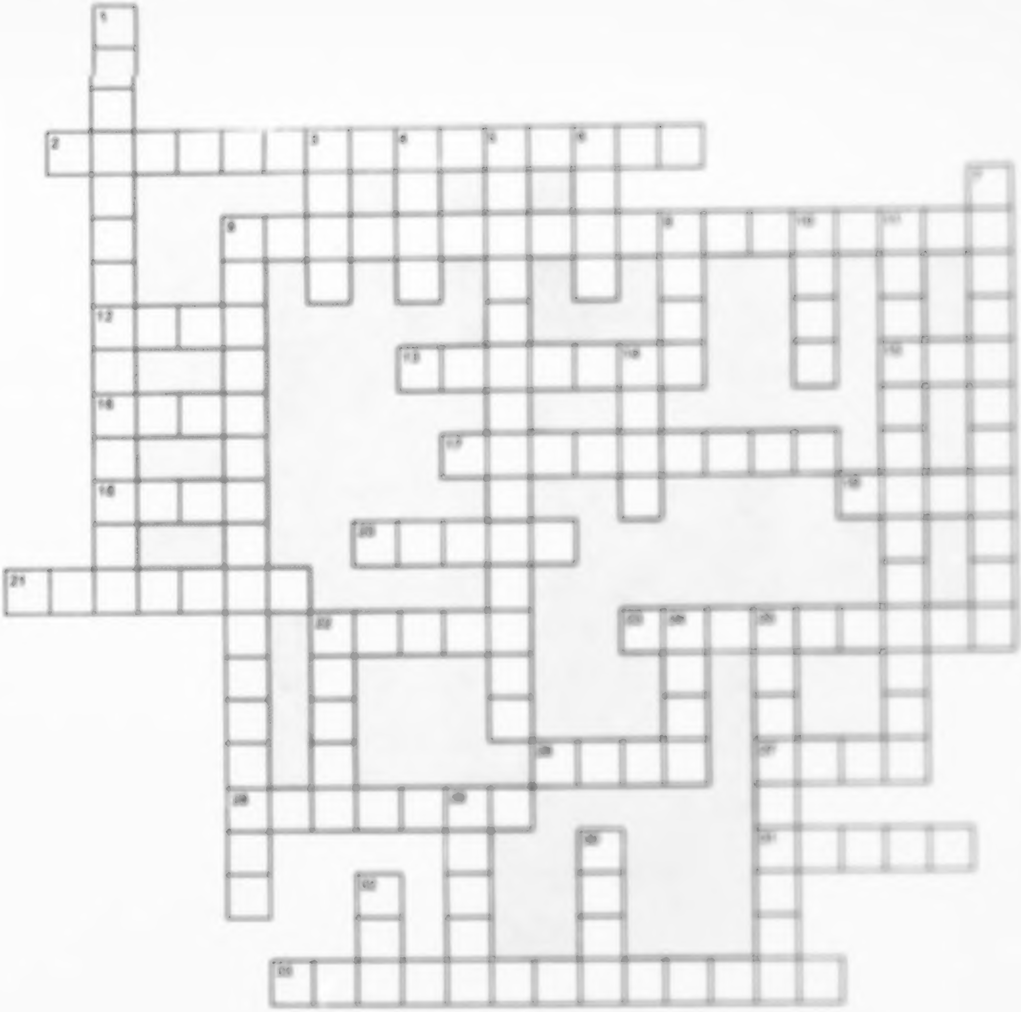
Across

2. Banking account against which depositer may write checks (2 wds.)
8. Deposit that has not reached and been recorded by the bank; does not appear on bank statement (2 wds.)
12. Unit of electric power
13. Amount of money checking account holder has in bank
15. Abbreviation for "very important person"
16. Opposite of *found*
17. Person who places money in a bank account
18. What most people get from the bank to buy a car
19. Heavy piece of timber used as a roof support
20. Form used to withdraw money from a checking account
21. Money placed in a bank account
22. Person or business to receive payment; also person or business to whom you write a check
23. Check written when there is no money, or not enough money, in checking account
26. Past tense of *pay*
27. The first word in many fairy tales
28. To sign your name on the back of a check written to you
31. Dollars and ____________
33. Part of checkbook in which record is kept of checks written, deposits made, service fees charged, and account balance (2 wds.)

Down

1. Form used to withdraw money from a savings account (2 wds.)
3. A short letter; a thank-you ____________
4. Abbreviation for automobile
5. Check that has been paid by the bank (2 wds.)
6. The smallest whole number; one ____________
7. Instructions to the bank from a customer requesting that the bank not pay a check (2 wds.)
8. Those checks that have not reached and been recorded by the bank; they do not appear on bank statement (2 wds.)
9. Opposite of *take*
10. Opposite of *rich*
11. Fee a bank charges for its services (2 wds.)
14. What you like to have a lot of in your bank account
22. Sixteen ounces; British dollar
24. Not legally binding; useless
25. To make check register agree with checking-account statement balance
29. What you can afford to eat if you have a savings account
30. Tight or close fit; rhymes with *bug*
32. Past tense of *eat*

SUPPLEMENT #1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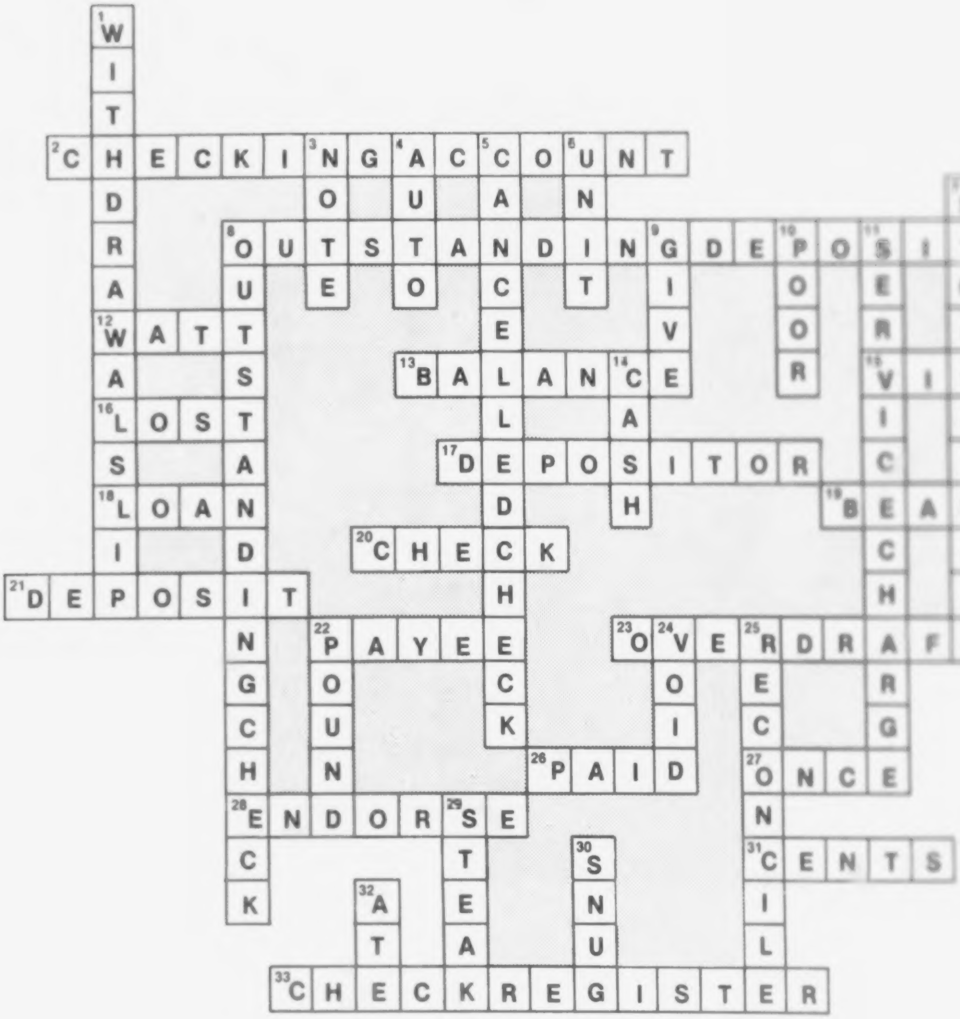
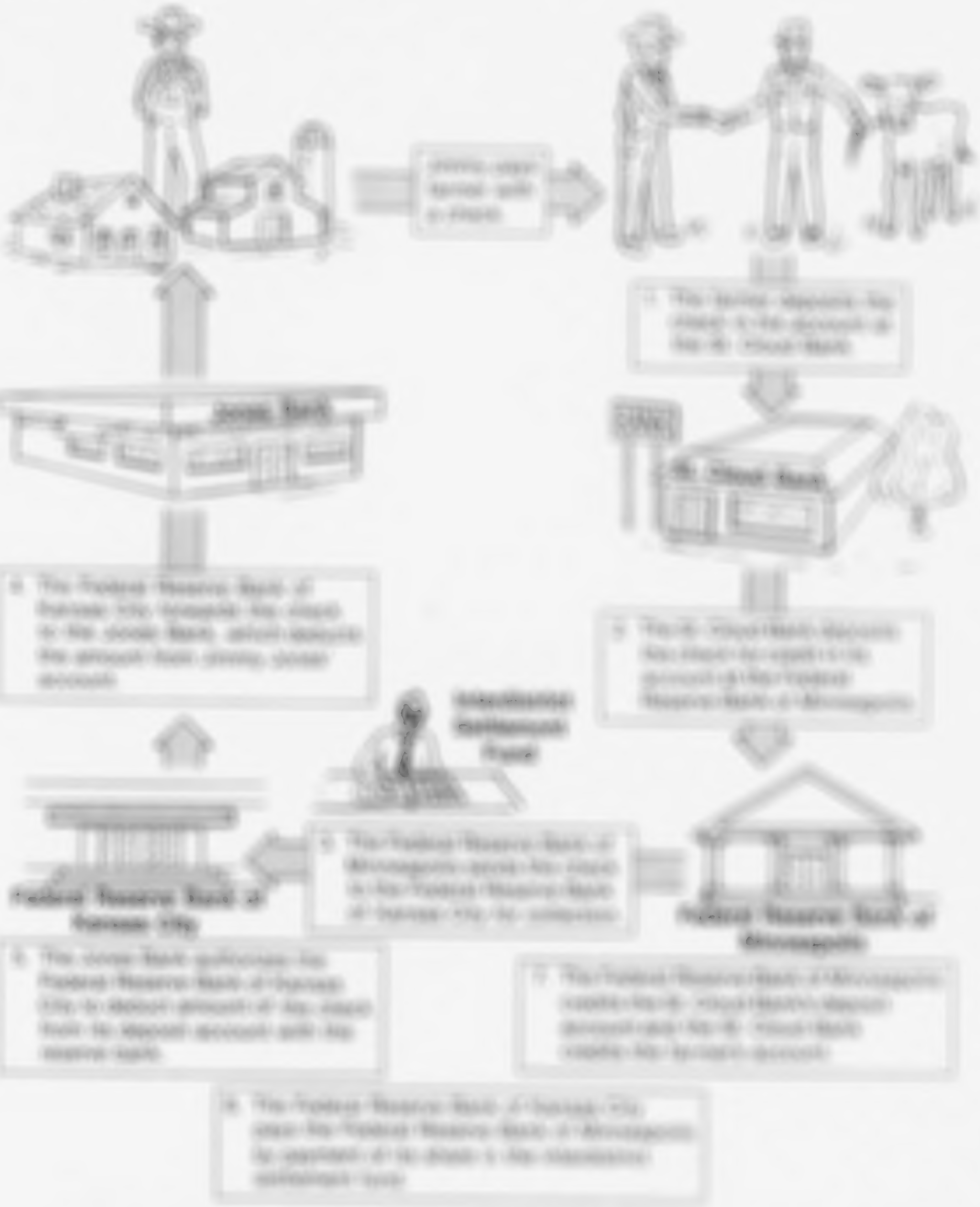
ANSWERS TO SUPPLEMENT #1


1 WITHDRAWAL SLIP
2 CHECKING ACCOUNT
3 NOTE
4 AUTO
5 CANCELLED CHECK
6 UNIT
7 STOP PAYMENT
8 OUTSTANDING DEPOSIT
8 OUTSTANDING CHECK
9 GIVE
10 POOR
11 SERVICE CHARGE
12 WATT
13 BALANCE
14 CASH
15 VIP
16 LOST
17 DEPOSITOR
18 LOAN
19 BEAM
20 CHECK
21 DEPOSIT
22 PAYEE
22 POUN
23 OVERDRAFT
24 VOID
25 RECONCILE
26 PAID
27 ONCE
28 ENDORSE
29 STEAK
30 SNUG
31 CENTS
32 ATE
33 CHECKREGISTER

SUGGESTED ACTIVITIES

SUPPLEMENT 40 — HOW CHECKS TRAVEL

Suppose Jimmy Jones, living in Jones, Oklahoma, buys a registered dairy heifer calf from a farmer in St. Cloud, Minnesota.


Jones Bank
BANK
St. Cloud Bank
Interdistrict Settlement Fund
Federal Reserve Bank of Kansas City
Federal Reserve Bank of Minneapolis

Jimmy pays farmer with a check.

1. The farmer deposits the check in his account at the St. Cloud Bank.

2. The St. Cloud Bank deposits the check for credit to its account at the Federal Reserve Bank of Minneapolis.

3. The Federal Reserve Bank of Minneapolis sends the check to the Federal Reserve Bank of Kansas City for collection.

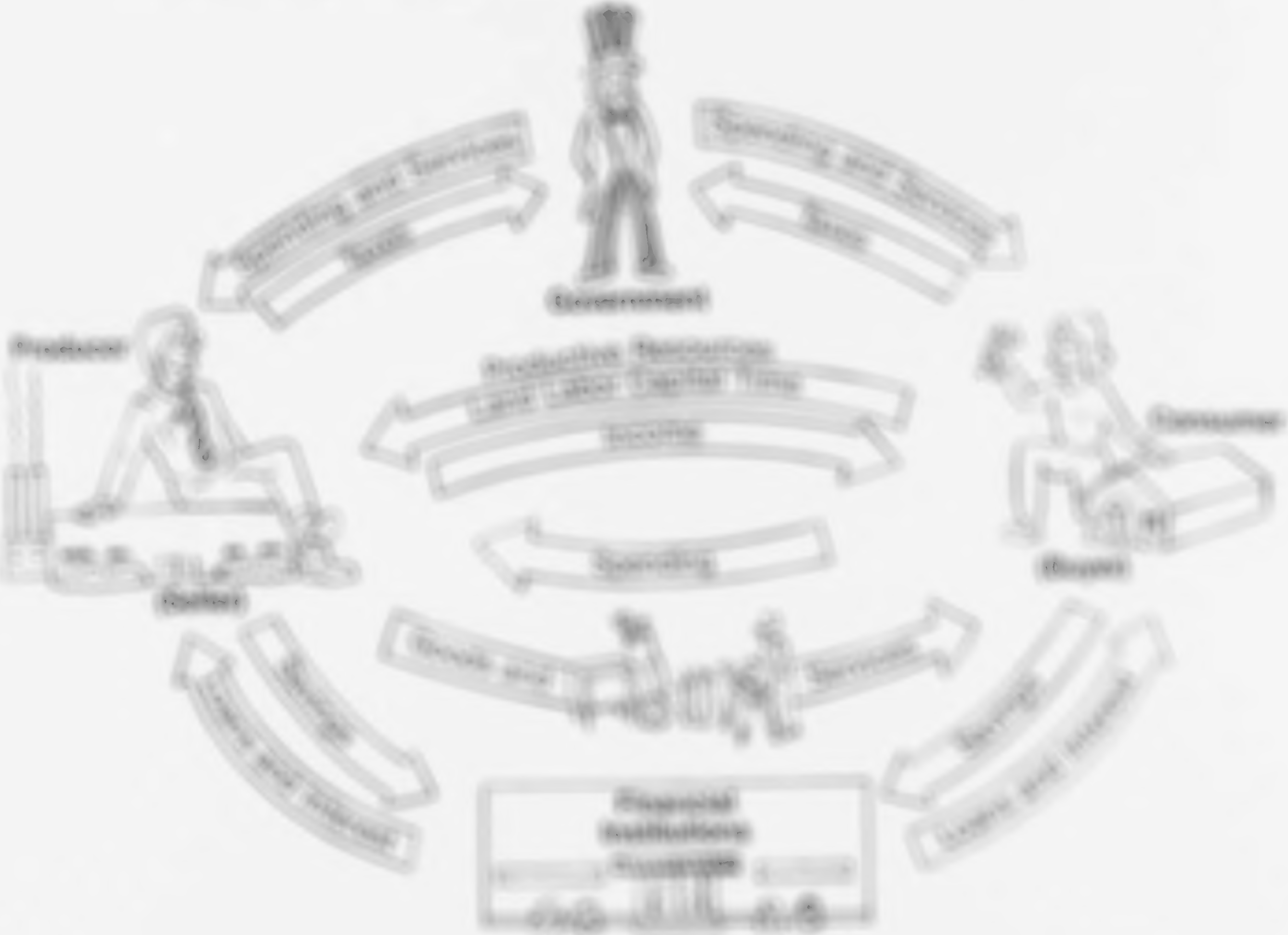
4. The Federal Reserve Bank of Kansas City forwards the check to the Jones Bank, which deducts the amount from Jimmy Jones' account.

5. The Jones Bank authorizes the Federal Reserve Bank of Kansas City to deduct amount of the check from its deposit account with the reserve bank.

6. The Federal Reserve Bank of Kansas City pays the Federal Reserve Bank of Minneapolis by payment of its share in the interdistrict settlement fund.

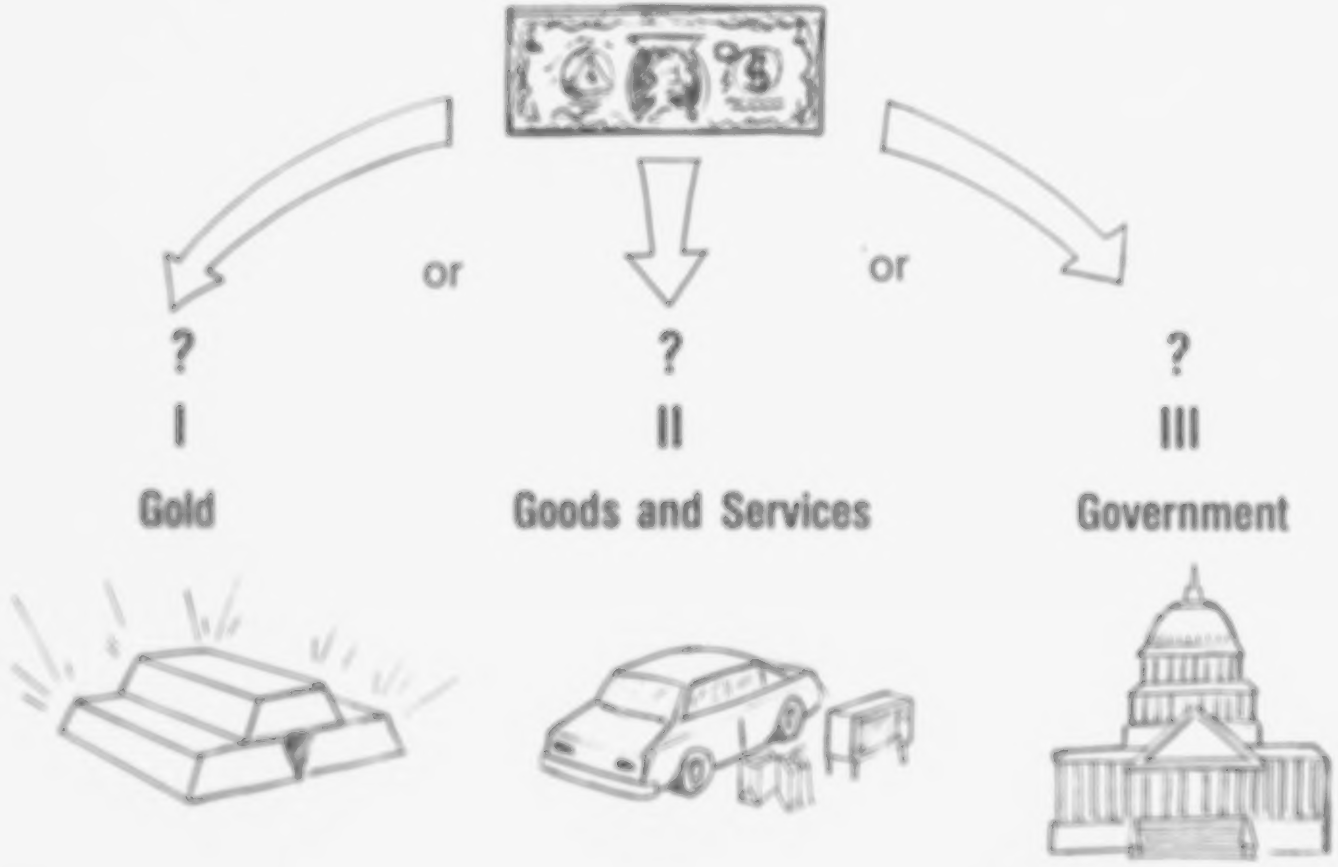
7. The Federal Reserve Bank of Minneapolis credits the St. Cloud Bank's deposit account and the St. Cloud Bank credits the farmer's account.

Model of the American Economic System



Spending and Services
Taxes
Government
Spending and Services
Taxes
Producer
Productive Resources
Land Labor Capital Time
Income
Consumer
Spending
Seller
Buyer
Goods and Services
Savings
Loans and Interest
Savings
Loans and Interest
Financial
Institutions
Accounts

Money: What Gives It Value?



or

or

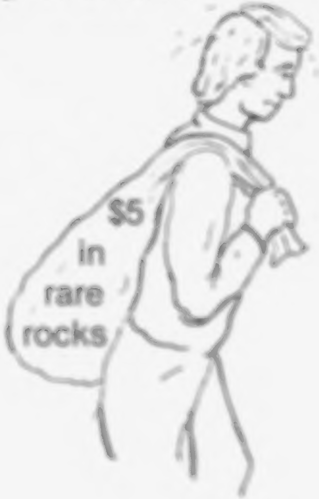
?
I
Gold

?
II
Goods and Services

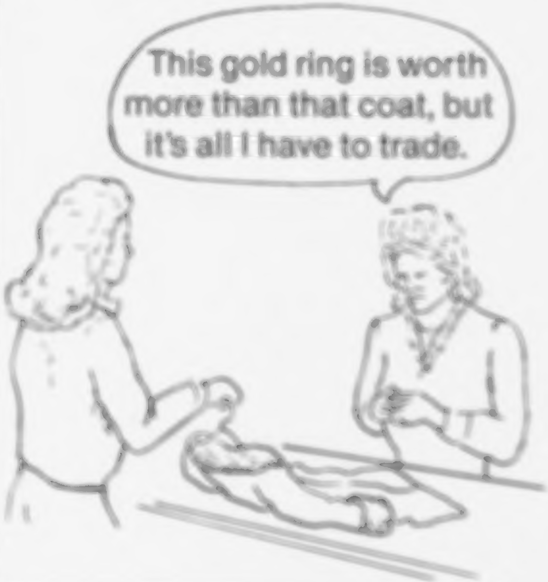
?
III
Government

Characteristics of Money

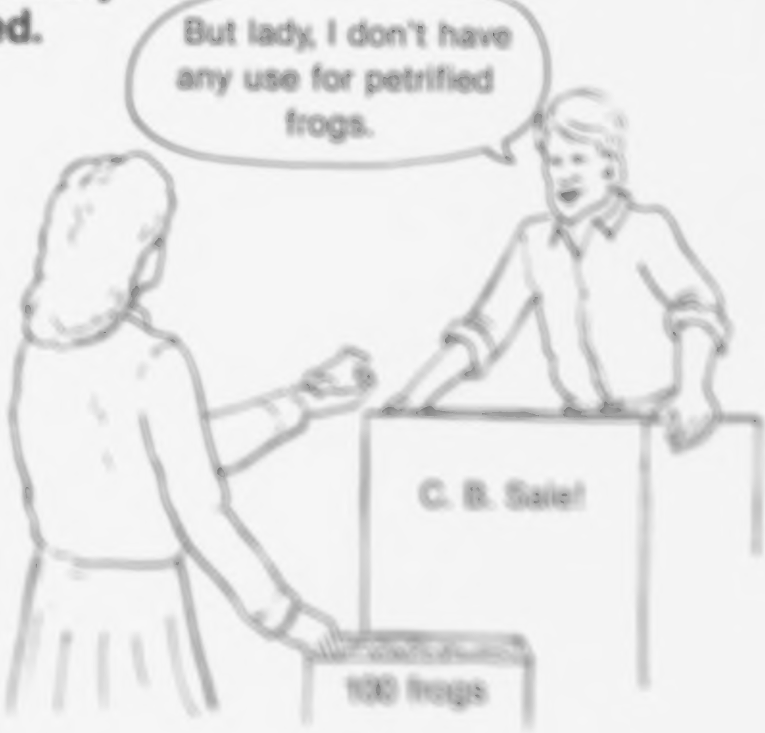
It is easy to carry around.


$5 in rare rocks

It is easily divisible.

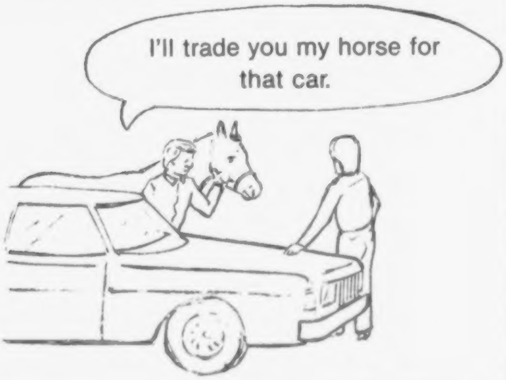

This gold ring is worth more than that coat, but it's all I have to trade.

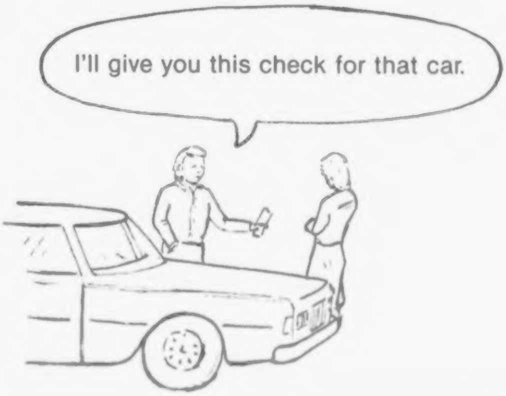
It is generally accepted.


But lady, I don't have any use for petrified frogs.
C. B. Sale!
100 frogs

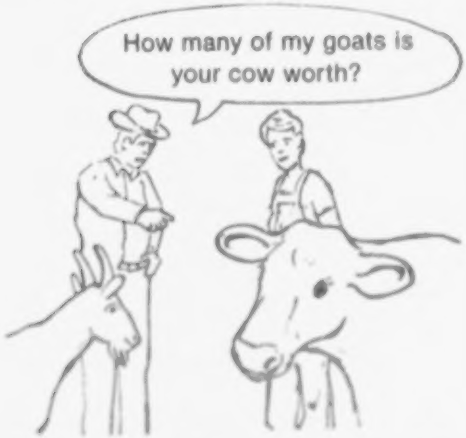
Functions of Money

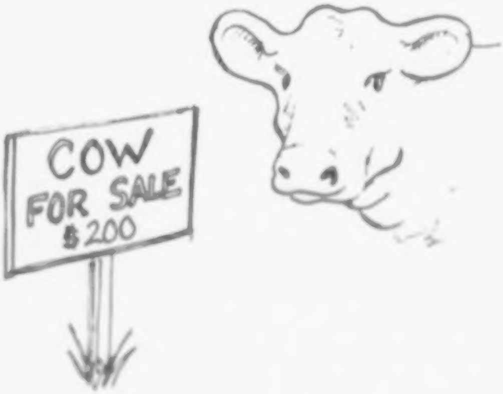
Medium of Exchange


I'll trade you my horse for that car.

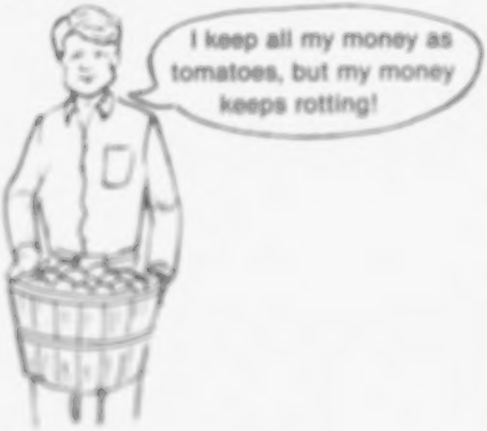

I'll give you this check for that car.

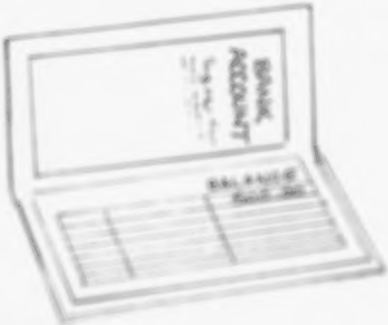
Measure of Value


How many of my goats is your cow worth?


COW
FOR SALE
$200

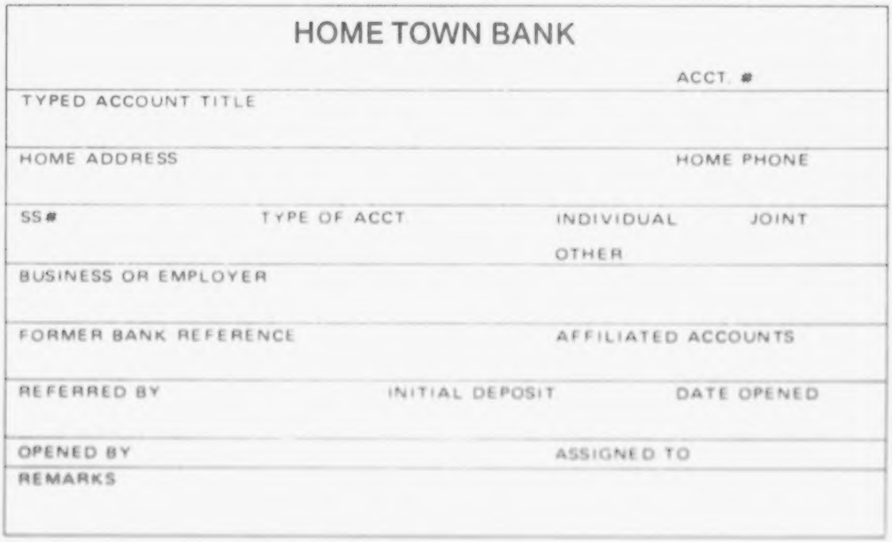
Store of Value


I keep all my money as tomatoes, but my money keeps rotting!


BANK ACCOUNT
BALANCE

Signature Card

(Front)



HOME TOWN BANK

ACCT. #

TYPED ACCOUNT TITLE

HOME ADDRESS HOME PHONE

SS# TYPE OF ACCT INDIVIDUAL JOINT OTHER

BUSINESS OR EMPLOYER

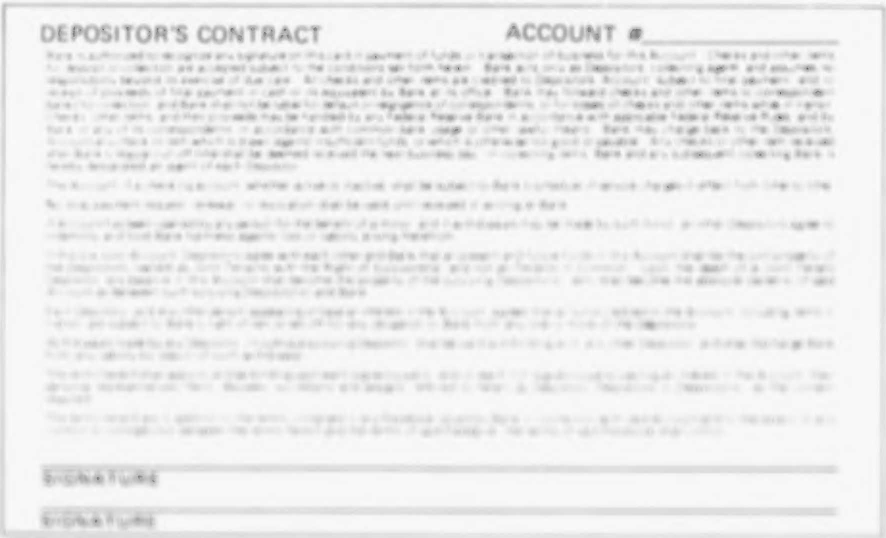
FORMER BANK REFERENCE AFFILIATED ACCOUNTS

REFERRED BY INITIAL DEPOSIT DATE OPENED

OPENED BY ASSIGNED TO

REMARKS

(Back)



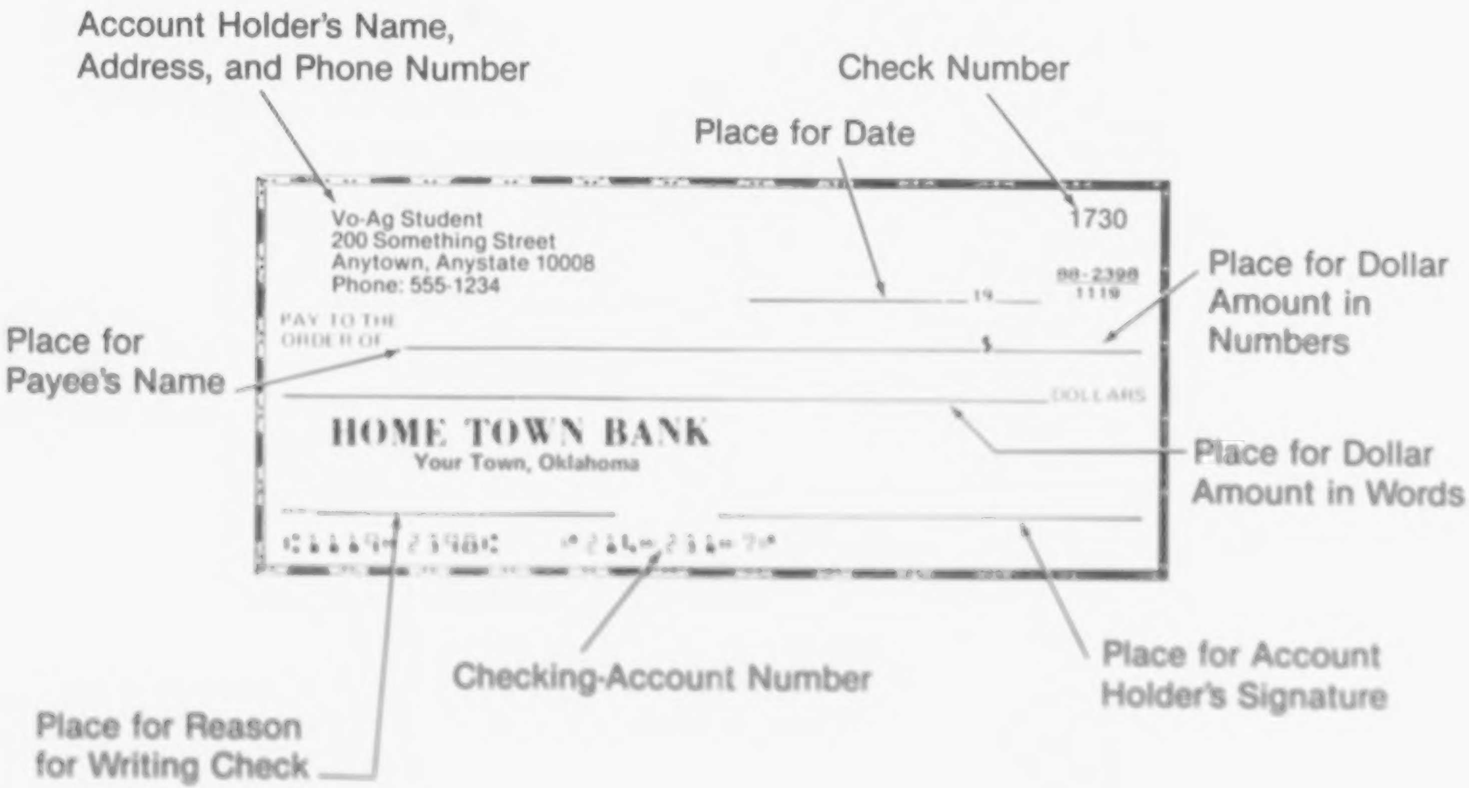
DEPOSITOR'S CONTRACT ACCOUNT #__________

SIGNATURE

SIGNATURE

BEST COPY AVAILABLE

Blank Personal Check



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1730

88-2398
1119

19

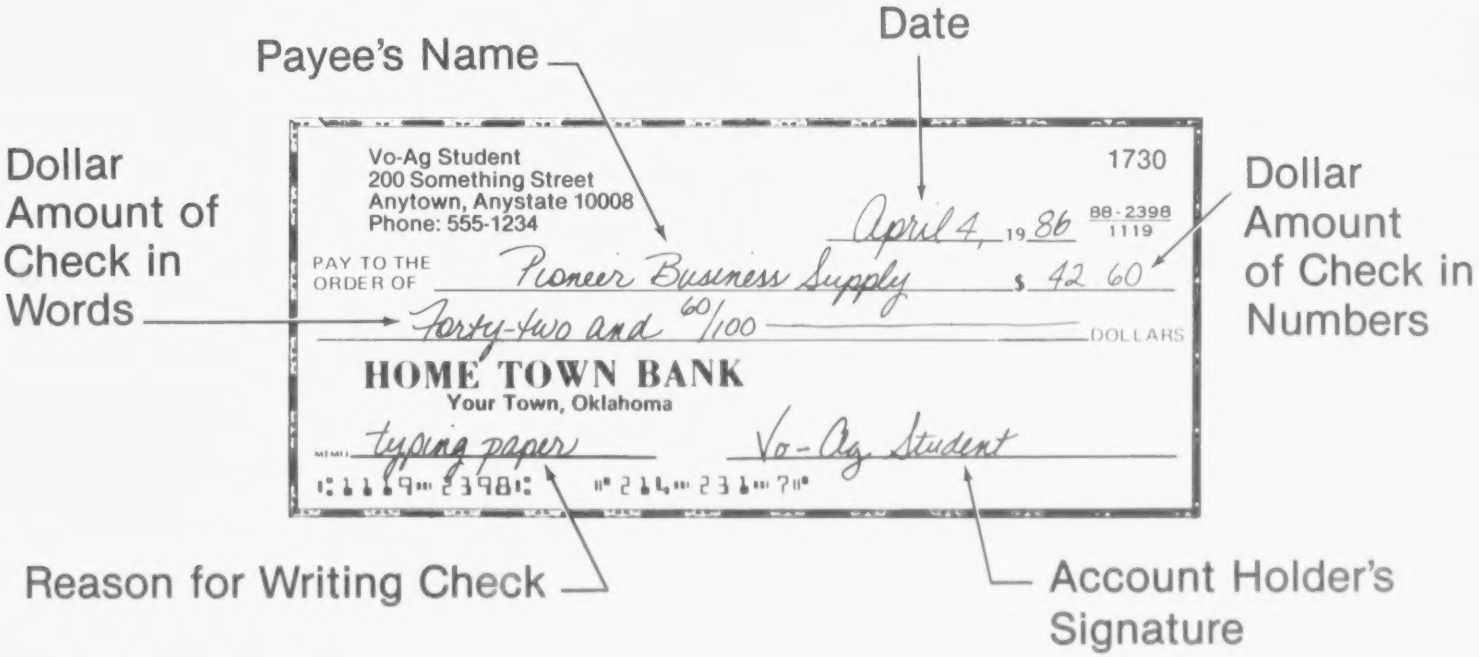
PAY TO THE
ORDER OF $

DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

Account Holder's Name, Address, and Phone Number
Check Number
Place for Date
Place for Dollar Amount in Numbers
Place for Payee's Name
Place for Dollar Amount in Words
Checking-Account Number
Place for Account Holder's Signature
Place for Reason for Writing Check

Completed Personal Check


Date
Payee's Name
Dollar Amount of Check in Words
Dollar Amount of Check in Numbers
Reason for Writing Check
Account Holder's Signature

Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1730

April 4, 19 86

88-2398
1119

PAY TO THE ORDER OF Pioneer Business Supply $ 42 60

Forty-two and 60/100 DOLLARS

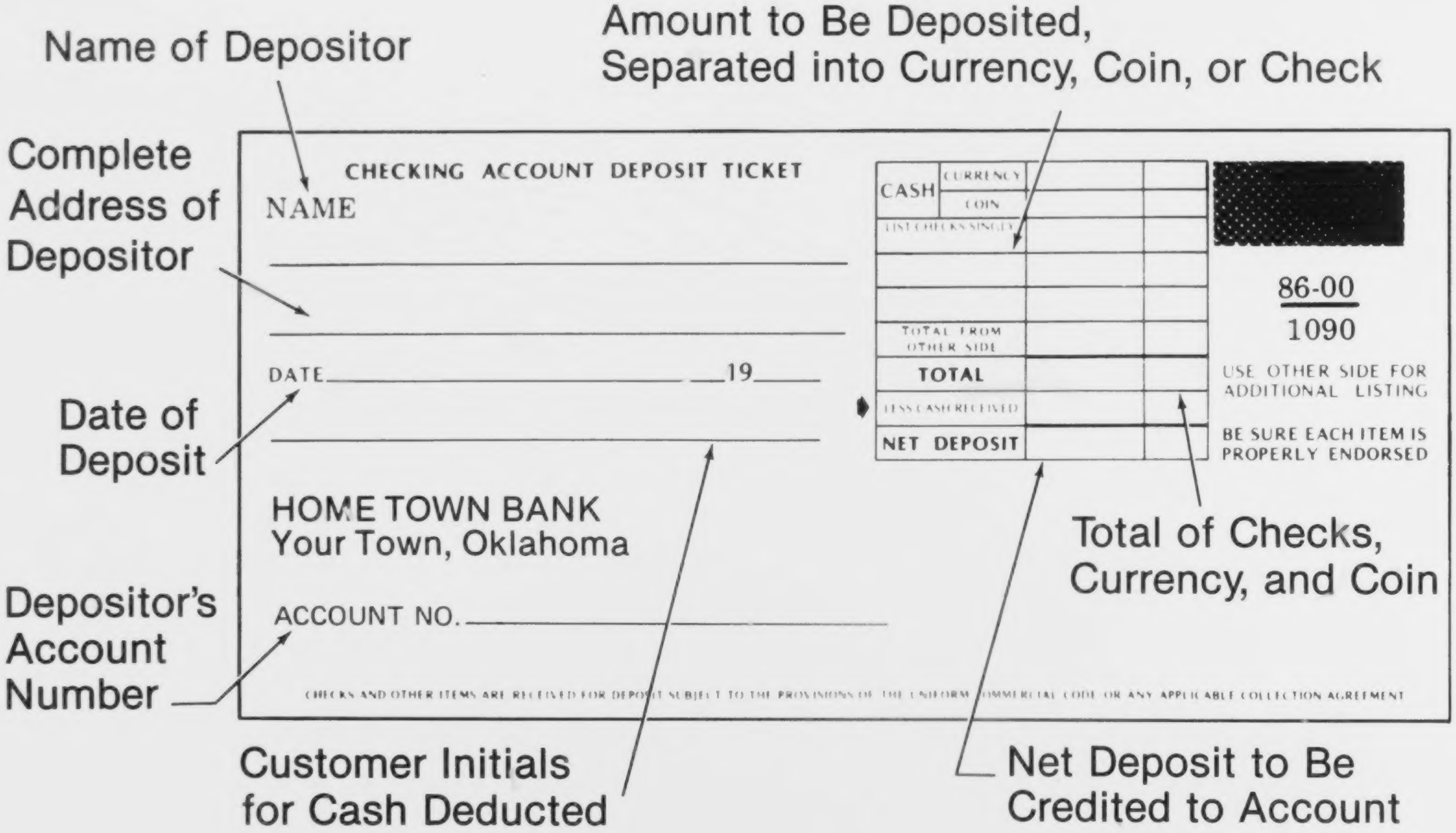
HOME TOWN BANK
Your Town, Oklahoma

MEMO typing paper

Vo-Ag Student

⑆1119⑈ 2398⑆ ⑈214⑈ 231⑈7⑈

Checking-Account Deposit Slip



Name of Depositor

Complete Address of Depositor

Date of Deposit

Depositor's Account Number

Amount to Be Deposited, Separated into Currency, Coin, or Check

Total of Checks, Currency, and Coin

Customer Initials for Cash Deducted

Net Deposit to Be Credited to Account

CHECKING ACCOUNT DEPOSIT TICKET

NAME ____________________

____

DATE ____________ 19____

____

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. ____________________

CASH	CURRENCY		
	COIN		
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

[redacted]

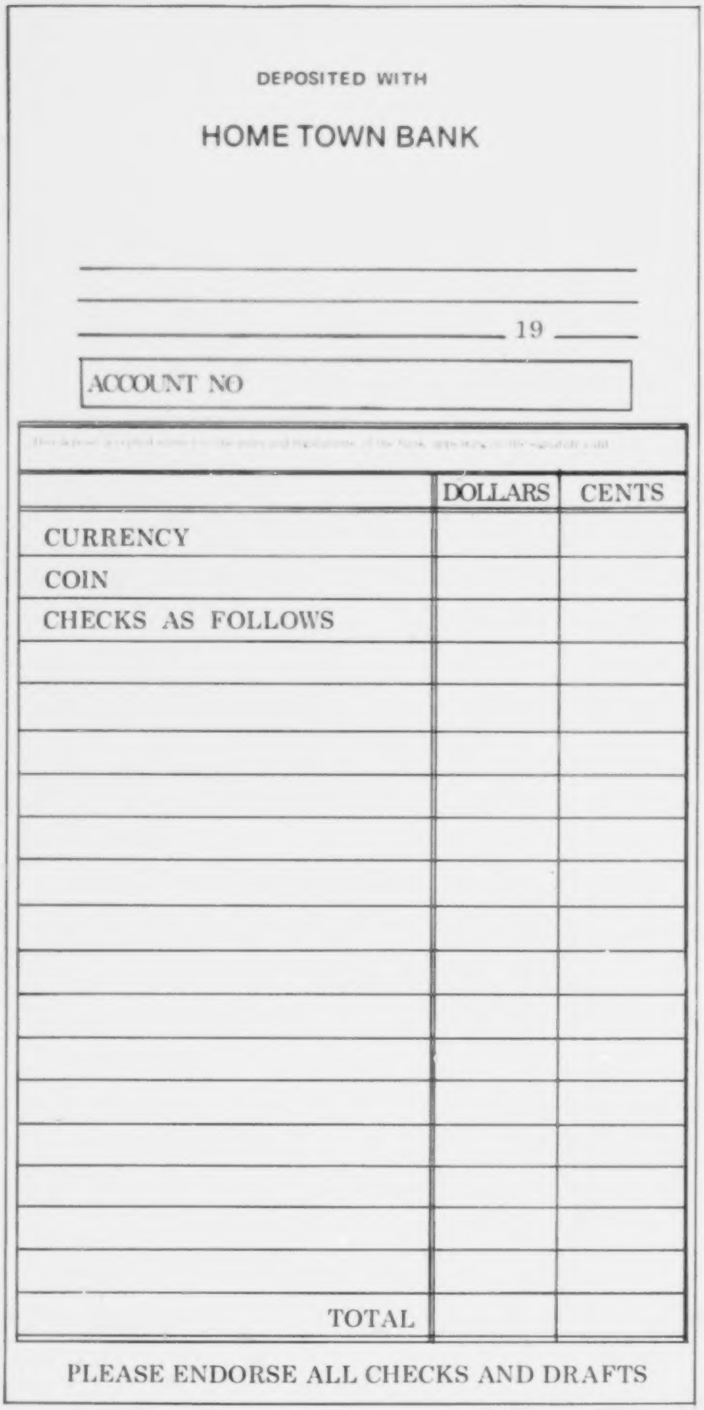
86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

Vertical Deposit Slip



DEPOSITED WITH

HOME TOWN BANK

____

____

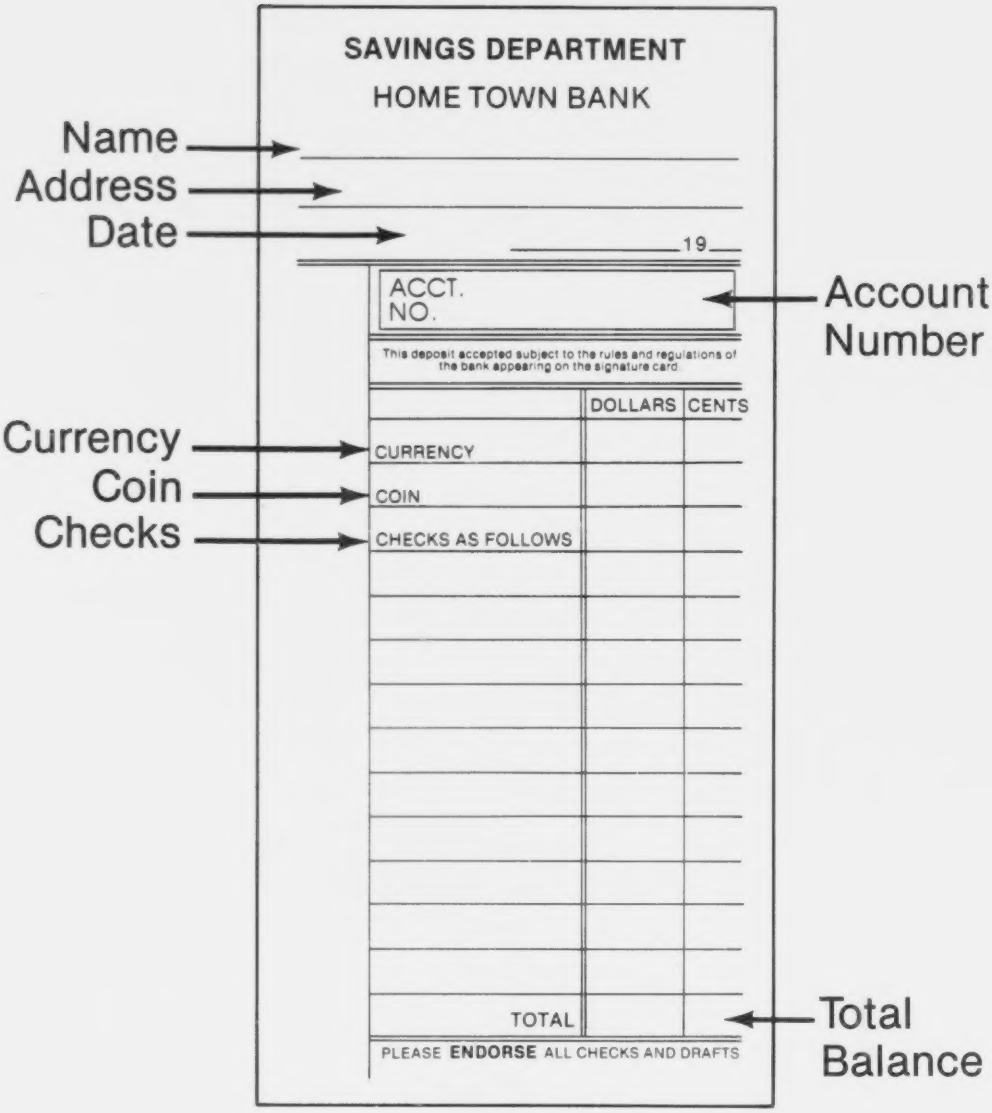
_______________________ 19 _____

ACCOUNT NO

	DOLLARS	CENTS
CURRENCY		
COIN		
CHECKS AS FOLLOWS		
TOTAL		

PLEASE ENDORSE ALL CHECKS AND DRAFTS

Savings-Account Deposit Slip


Name
Address
Date
Account Number
Currency
Coin
Checks
Total Balance

SAVINGS DEPARTMENT

HOME TOWN BANK

____

____

____________ 19__

ACCT. NO.

This deposit accepted subject to the rules and regulations of the bank appearing on the signature card.

	DOLLARS	CENTS
CURRENCY		
COIN		
CHECKS AS FOLLOWS		
TOTAL		

PLEASE **ENDORSE** ALL CHECKS AND DRAFTS

Blank Check Register

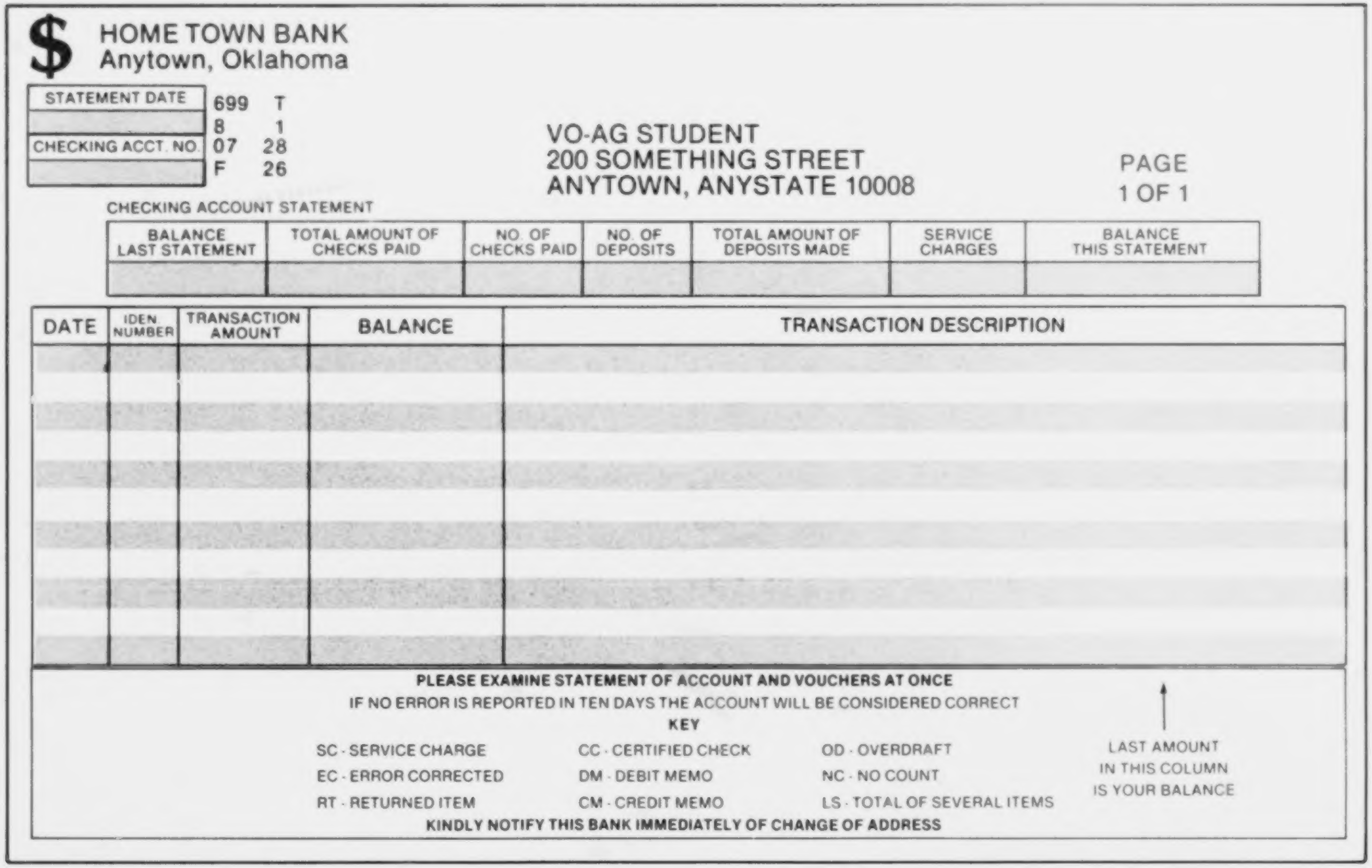
RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (−)	√ T	FEE (IF ANY) (−)	DEPOSIT/CREDIT (+)	BALANCE	
							$	
			$		$	$		

REMEMBER TO RECORD AUTOMATIC PAYMENTS/DEPOSITS ON DATE AUTHORIZED

Checking-Account Statement

(Front)



$ HOME TOWN BANK
Anytown, Oklahoma

STATEMENT DATE	699 T
	8 1
CHECKING ACCT. NO.	07 28
	F 26

VO-AG STUDENT
200 SOMETHING STREET
ANYTOWN, ANYSTATE 10008

PAGE
1 OF 1

CHECKING ACCOUNT STATEMENT

BALANCE LAST STATEMENT	TOTAL AMOUNT OF CHECKS PAID	NO. OF CHECKS PAID	NO. OF DEPOSITS	TOTAL AMOUNT OF DEPOSITS MADE	SERVICE CHARGES	BALANCE THIS STATEMENT

DATE	IDEN NUMBER	TRANSACTION AMOUNT	BALANCE	TRANSACTION DESCRIPTION

PLEASE EXAMINE STATEMENT OF ACCOUNT AND VOUCHERS AT ONCE
IF NO ERROR IS REPORTED IN TEN DAYS THE ACCOUNT WILL BE CONSIDERED CORRECT
KEY

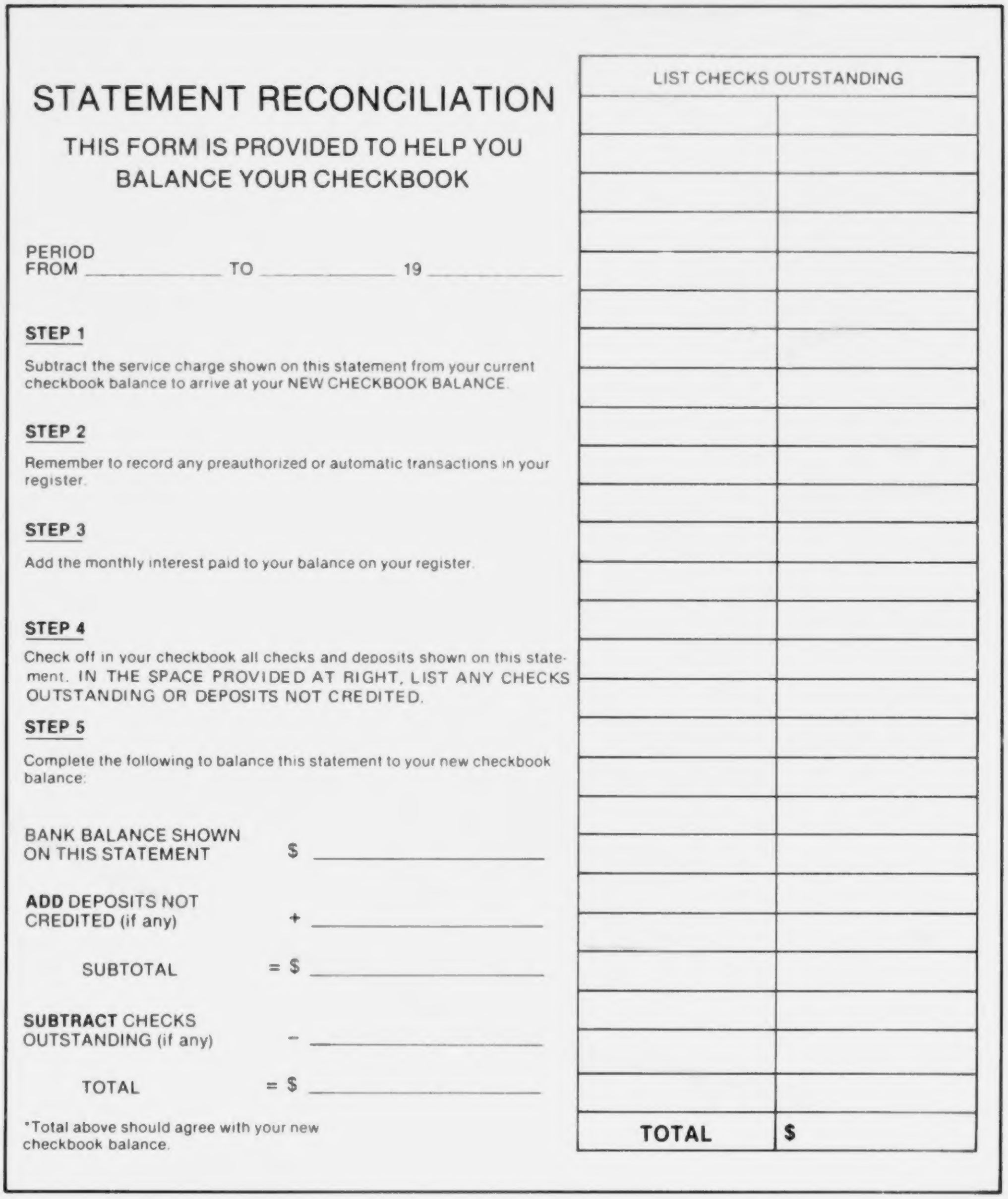
SC - SERVICE CHARGE
EC - ERROR CORRECTED
RT - RETURNED ITEM
CC - CERTIFIED CHECK
DM - DEBIT MEMO
CM - CREDIT MEMO
OD - OVERDRAFT
NC - NO COUNT
LS - TOTAL OF SEVERAL ITEMS

↑
LAST AMOUNT
IN THIS COLUMN
IS YOUR BALANCE

KINDLY NOTIFY THIS BANK IMMEDIATELY OF CHANGE OF ADDRESS

Checking-Account Statement

(Back)



STATEMENT RECONCILIATION

THIS FORM IS PROVIDED TO HELP YOU BALANCE YOUR CHECKBOOK

PERIOD FROM ____________ TO ____________ 19 ____________

STEP 1

Subtract the service charge shown on this statement from your current checkbook balance to arrive at your NEW CHECKBOOK BALANCE.

STEP 2

Remember to record any preauthorized or automatic transactions in your register.

STEP 3

Add the monthly interest paid to your balance on your register.

STEP 4

Check off in your checkbook all checks and deposits shown on this statement. IN THE SPACE PROVIDED AT RIGHT, LIST ANY CHECKS OUTSTANDING OR DEPOSITS NOT CREDITED.

STEP 5

Complete the following to balance this statement to your new checkbook balance:

BANK BALANCE SHOWN ON THIS STATEMENT $ ____________________

ADD DEPOSITS NOT CREDITED (if any) + ____________________

SUBTOTAL = $ ____________________

SUBTRACT CHECKS OUTSTANDING (if any) – ____________________

TOTAL = $ ____________________

*Total above should agree with your new checkbook balance.

LIST CHECKS OUTSTANDING	
TOTAL	**$**

HANDLE FINANCES
UNIT I

INFORMATION SHEET

I. Terms and definitions associated with handling finances

A. Money management — Systematic method of planning for spending based on expected income

B. Goal — Objective a person is willing to work toward achieving

C. Consumer — Anyone who uses goods and services

D. Budget — Plan for the use of money based on goals and expected income and expenses

E. Financial institution — Establishment for the custody, loan, exchange, or issue of money; for the extension of credit; and for ease in sending funds

EXAMPLES: Bank, credit union, savings and loan association

F. Deposit — Money placed in an account

G. Checking account — Account against which depositor may write checks

H. Dividend — Share of profit paid to shareholders or stockholders in proportion to share of ownership

I. Depositor — Person who places money in an account

J. Interest — Price paid for the use of money over a period of time

K. Cancelled check — Check that has been paid by financial institution

L. Service charge — Fee financial institution charges for its services

M. Balance — Amount of money checking- or savings-account holder has in financial institution

N. Endorse — To sign your name on back of check written to you

O. Endorsement — Your name written in ink at left end on back of check

P. Stop payment — Customer's instructions to financial institution requesting that institution not pay a check

Q. Overdraft — Check written when there is no money, or not enough money, in checking account

R. Reconcile — To make balance in check register agree with balance on checking-account statement

S. Outstanding check — Check that has not reached and been recorded by financial institution and does not appear on checking-account statement

INFORMATION SHEET

   T. Outstanding deposit — Deposit that has not reached and been recorded by financial institution and does not appear on checking-account statement

   U. Payee — Person or business to receive payment; also person or business to whom you write a check

      (NOTE: The payee's name is written on the line of the check that reads *Pay to the order of. . .*)

II. Benefits of effective money management

   A. Helps you use your income efficiently

   B. Helps you appreciate value of money you earn

   C. Helps you achieve short-term and long-range goals

III. Guidelines that promote effective money management

   A. Be aware of factors that influence consumer spending

   B. Set personal goals

   C. Use a budget

   D. Review money-management decisions and achievement of goals

IV. Factors that influence consumer spending

   A. Income

   B. Lifestyle

   C. Advertising

   D. Availability of goods and services

   E. Influence of others

      (NOTE: Sometimes people buy items they cannot afford because they want to impress or please others or because of peer pressure.)

   F. Basic needs and wants

   G. Prices

   H. Fashion

      (NOTE: Fashion probably influences consumer choices more than anything else except income. Fashion applies to many things such as music, dancing, and leisure-time activities, as well as clothing.)

   I. Mood

INFORMATION SHEET

V. Functions of financial institutions

  A. Receive deposits

  B. Provide checking and savings accounts

  C. Transfer money from one account to another

  D. Make loans to businesses and individuals

  E. Provide helpful services

  (NOTE: Services include special types of checks such as traveler's checks, cashier's checks, bank money orders; financial advice; travel service; safety deposit boxes; and bonds. A fee is usually charged for these services.)

VI. Types of financial institutions and their descriptions

  A. Commercial bank — Financial institution owned and operated by its stockholders for profits; often called *full-service bank* because it offers a variety of services

  (NOTE: Because of the wide variety of services they provide, commercial banks offer a great deal of convenience for consumers.)

  B. Savings and loan association — Nonprofit financial institution owned by shareholders who receive dividends on savings; may offer higher interest rates for savings accounts and time deposits than commercial banks may offer

  (NOTE: A time deposit is money deposited in a savings account for six months or longer to receive higher interest.)

  C. Credit union — Nonprofit financial institution owned and operated by its members to save and borrow money; usually offers higher interest rates on savings than commercial banks and savings and loan associations

  D. Mutual savings bank — Financial institution specializing in savings accounts and owned by its depositors; usually the earnings paid on savings are a little higher than those paid at commercial banks; but if the financial institution earns no profit, the depositors receive little or no interest on their savings

VII. Reasons for saving money

  A. Emergencies (unforeseen needs)

  (NOTE: Money should be set aside for unforeseen needs. It is often recommended that the amount of savings should equal at least three months' income.)

  B. Expensive purchases

  EXAMPLE: Car

  C. Large recurring expenses

  EXAMPLES: Insurance, car tag, gasoline for car

  D. Retirement

E. College

F. Vacations

G. Investments

VIII. Guidelines for saving money

A. Start now

(NOTE: It does not matter that you may have only a few dollars. Any money saved is better than none.)

B. Make savings deposits soon after pay is received

(NOTE: Carry only the amount of money that is needed. With less cash available, the chance for impulse buying decreases.)

C. Save a realistic amount regularly

(NOTE: Try to save some money from each pay period, but do not put into savings money needed to pay current expenses and unpaid bills.)

D. Select a savings account that meets personal needs

EXAMPLES: Combination savings account, Christmas club, earn interest

E. Keep savings goal(s) in mind

IX. Types of savings methods and their definitions

(NOTE: Although using the "cookie jar" method to put aside money is often convenient and effective, money placed in an institution produces interest for the saver and protects the saver against loss or theft.)

A. Savings account — Account that allows deposits and withdrawals to be made in varying amounts

EXAMPLES: Passbook saving account, money market account

(NOTE: The amount of interest a person earns depends on the annual rate of interest, the methods of calculating interest, the number of times per year the interest is compounded, and the length of time the money is in the account.)

B. Certificate of deposit — Money deposited for a set period of time; earns a set annual rate of interest

(NOTE: A certificate of deposit is also called a *CD, savings certificate, time deposit*, or *time account*.)

C. Endowment insurance — Type of life-insurance policy that offers savings features in addition to the protection afforded the policyholder

INFORMATION SHEET

D. Annuity — Type of protection purchased from insurance company for the purpose of providing income for the policyholder until death

(NOTE: An annuity can be bought in one lump sum or in regular payments. In return for this sum of money, the insurance company will pay a stated monthly or yearly income for a set number of years or for life. Payments usually begin when the policyholder retires.)

E. Employee savings plan — Specific plan involving savings features for a worker

(NOTE: Some of these plans involve saving through regular institutions by payroll deduction. Others, such as specialized savings plans, are included among the fringe benefits for an organization's employees. Sometimes the employer will match the employee's contributions. Various pension and profit-sharing plans involve savings features for employees.)

F. Retirement account — Savings plan that helps people establish financial security for the time when they are no long working

EXAMPLES: Individual Retirement Account (IRA) is an account to which taxpayers may make annual tax-deductible contributions up to a set amount. The funds in the account accumulate and earn interest and may not be withdrawn before retirement without penalty.

Keogh Plan is a retirement account for self-employed persons.

G. Certificate — Financial instrument that earns interest over a period of time

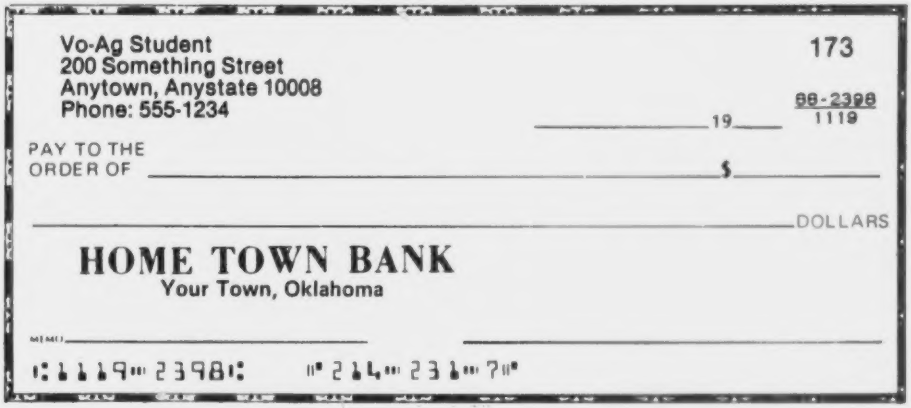
EXAMPLES: U.S. savings bonds, treasury bills

X. Types of financial instruments and their descriptions (Figures 1 - 10)

A. Check — Written form used to withdraw money from a checking account

EXAMPLE:

FIGURE 1



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

173

88-2398
1119

______ 19____

PAY TO THE
ORDER OF ______ $______

______ DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

MEMO ______ ______

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

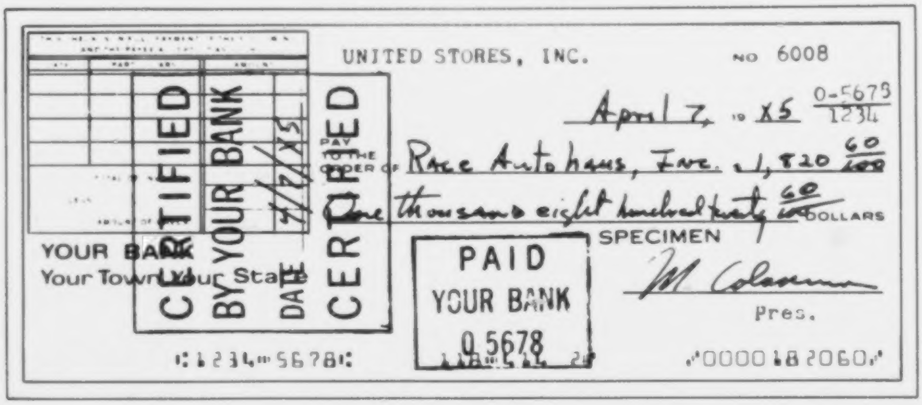
INFORMATION SHEET

B. Certified check — Ordinary personal check drawn by a depositor on which the financial institution stamps or writes a certification that guarantees its payment

(NOTE: A certified check has practically the same status as a check, provided the financial institution is known and has a good reputation. One disadvantage of a certified check to the depositor is that it will not be returned with the other cancelled checks.)

EXAMPLE:

FIGURE 2



UNITED STORES, INC. NO 6008

April 7, 19 X5 0-5678/1234

PAY TO THE ORDER OF Race Autohaus, Inc. $1,820 60/100

One thousand eight hundred twenty 60/100 DOLLARS

SPECIMEN

Pres.

YOUR BANK
Your Town Your State

CERTIFIED
BY YOUR BANK
DATE 4/7/X5
CERTIFIED

PAID
YOUR BANK
0 5678

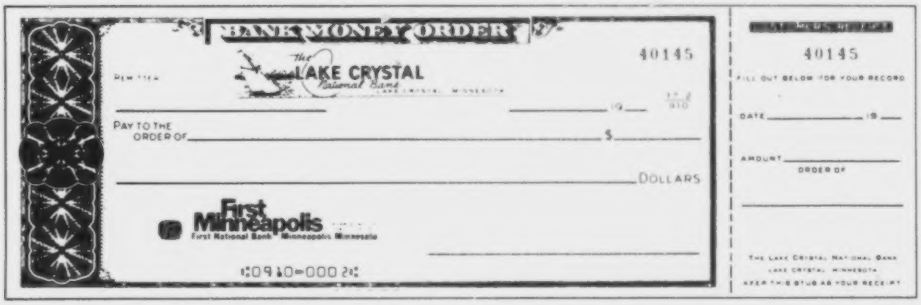
⑆1234⑈5678⑆ 0000182060

C. Money order — Written form a person buys to send money to another person

(NOTE: A money order may also be called a "cashier's check.")

EXAMPLE:

FIGURE 3



BANK MONEY ORDER

40145

REMITTER

The LAKE CRYSTAL National Bank

19__

PAY TO THE ORDER OF $

DOLLARS

First Minneapolis
First National Bank Minneapolis Minnesota

⑆0910⑈0002⑆

40145

FILL OUT BELOW FOR YOUR RECORD

DATE 19

AMOUNT

ORDER OF

THE LAKE CRYSTAL NATIONAL BANK
LAKE CRYSTAL MINNESOTA
KEEP THIS STUB AS YOUR RECEIPT

BEST COPY AVAILABLE

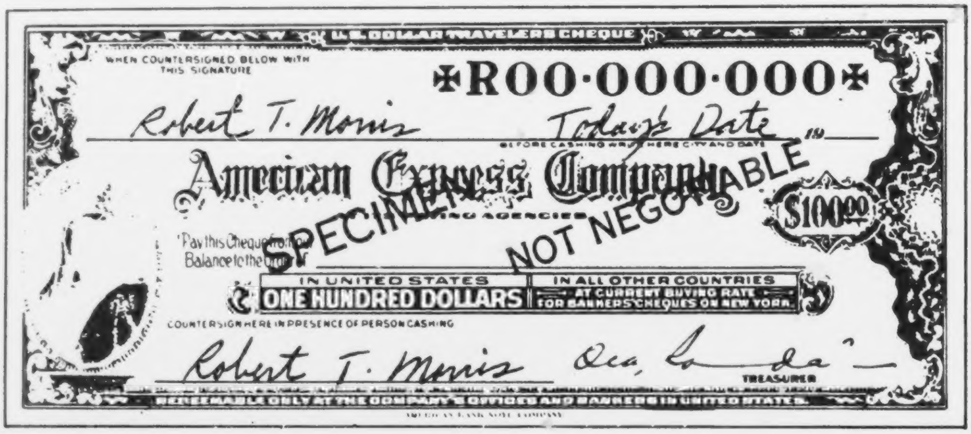
INFORMATION SHEET

D. Traveler's check — Special form of check that is signed by the buyer at time of purchase

(NOTE: When the traveler's check is cashed, it must be signed again in the presence of the person cashing it with a signature that matches the original signature. Traveler's checks can be replaced rather quickly if lost.)

EXAMPLE:

FIGURE 4



U.S. DOLLAR TRAVELERS CHEQUE

WHEN COUNTERSIGNED BELOW WITH THIS SIGNATURE

✠R00·000·000✠

Robert T. Morris

Today's Date 19

BEFORE CASHING WRITE HERE CITY AND DATE

American Express Company

SPECIMEN NOT NEGOTIABLE

$100.00

Pay this Cheque from our Balance to the order of

IN UNITED STATES ONE HUNDRED DOLLARS

IN ALL OTHER COUNTRIES AT CURRENT BUYING RATE FOR BANKERS CHEQUES ON NEW YORK.

COUNTERSIGN HERE IN PRESENCE OF PERSON CASHING

Robert T. Morris

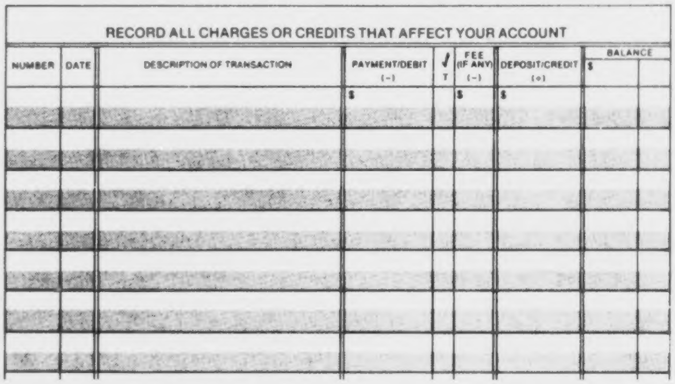
TREASURER

REDEEMABLE ONLY AT THE COMPANY'S OFFICES AND BANKERS IN UNITED STATES.

E. Check register — Portion of checkbook designed for recording checks written, deposits made, and service fees charged; and for calculating checking-account balance

EXAMPLES:

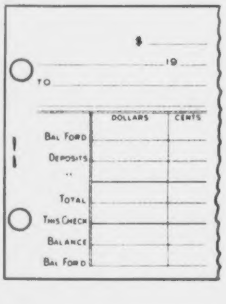
FIGURE 5



RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (−)	√ T	FEE (IF ANY) (−)	DEPOSIT/CREDIT (+)	BALANCE $	
			$		$	$		

FIGURE 6



$ ____

____ 19 ____

TO ____

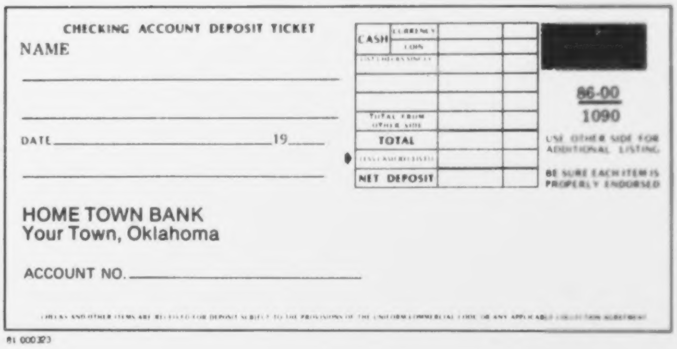
	DOLLARS	CENTS
BAL FORD		
DEPOSITS		
"		
TOTAL		
THIS CHECK		
BALANCE		
BAL FORD		

INFORMATION SHEET

F. Deposit slip — Written form for placing money in a checking or savings account

EXAMPLES:

FIGURE 7: Checking-account deposit slip



CHECKING ACCOUNT DEPOSIT TICKET

NAME ____________________

____

DATE ____________________ 19____

____

CASH	CURRENCY		
	COIN		
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

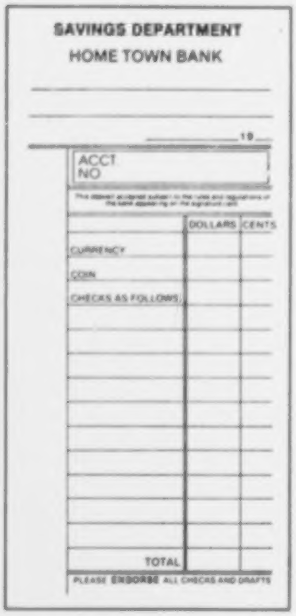
HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. ____________________

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

81 000323

FIGURE 8: Savings-account deposit slip



SAVINGS DEPARTMENT
HOME TOWN BANK

____

____

__________ 19____

ACCT NO

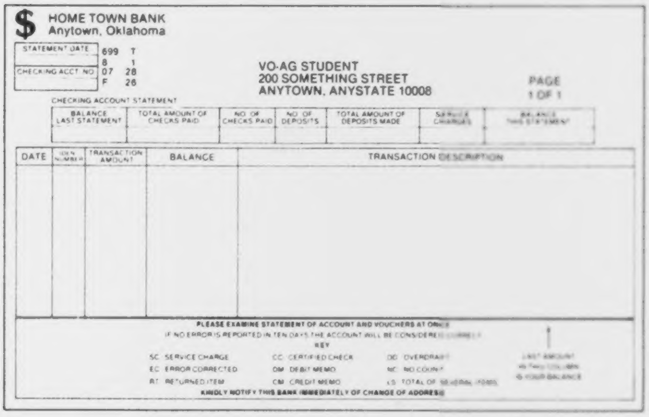
	DOLLARS	CENTS
CURRENCY		
COIN		
CHECKS AS FOLLOWS		
TOTAL		

PLEASE ENDORSE ALL CHECKS AND DRAFTS

G. Checking-account statement — Monthly report provided by financial institution of deposits, checks, service charges, and balances

EXAMPLES:

FIGURE 9: Front of checking-account statement



HOME TOWN BANK
Anytown, Oklahoma

STATEMENT DATE
CHECKING ACCT NO

699 T
8 1
07 28
F 26

VO-AG STUDENT
200 SOMETHING STREET
ANYTOWN, ANYSTATE 10008

PAGE
1 OF 1

CHECKING ACCOUNT STATEMENT

BALANCE LAST STATEMENT	TOTAL AMOUNT OF CHECKS PAID	NO. OF CHECKS PAID	NO. OF DEPOSITS	TOTAL AMOUNT OF DEPOSITS MADE	SERVICE CHARGES	BALANCE THIS STATEMENT

DATE	IDEN NUMBER	TRANSACTION AMOUNT	BALANCE	TRANSACTION DESCRIPTION

PLEASE EXAMINE STATEMENT OF ACCOUNT AND VOUCHERS AT ONCE
IF NO ERROR IS REPORTED IN TEN DAYS THE ACCOUNT WILL BE CONSIDERED CORRECT

KEY

SC SERVICE CHARGE	CC CERTIFIED CHECK	OD OVERDRAFT
EC ERROR CORRECTED	DM DEBIT MEMO	NC NO COUNT
RT RETURNED ITEM	CM CREDIT MEMO	LS TOTAL OF SEVERAL ITEMS

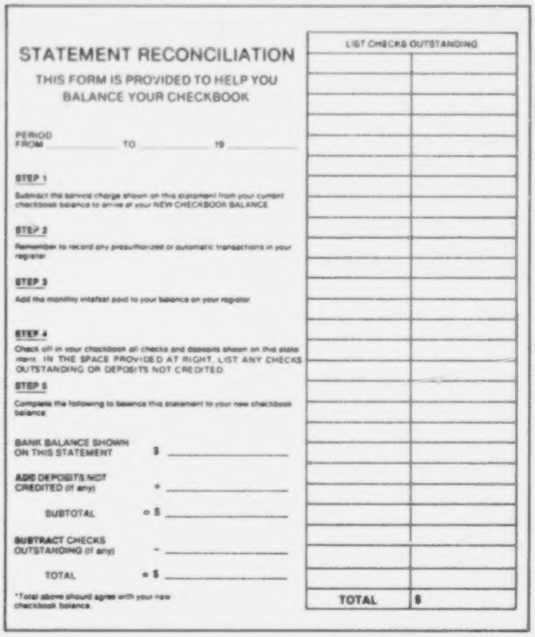
LAST AMOUNT IN THIS COLUMN IS YOUR BALANCE

KINDLY NOTIFY THIS BANK IMMEDIATELY OF CHANGE OF ADDRESS

BEST COPY AVAILABLE

INFORMATION SHEET

FIGURE 10: Back of checking-account statement



STATEMENT RECONCILIATION

THIS FORM IS PROVIDED TO HELP YOU BALANCE YOUR CHECKBOOK

PERIOD FROM ________ TO ________ 19 ________

STEP 1

Subtract the service charge shown on this statement from your current checkbook balance to arrive at your NEW CHECKBOOK BALANCE

STEP 2

Remember to record any preauthorized or automatic transactions in your register

STEP 3

Add the monthly interest paid to your balance on your register

STEP 4

Check off in your checkbook all checks and deposits shown on this statement. IN THE SPACE PROVIDED AT RIGHT, LIST ANY CHECKS OUTSTANDING OR DEPOSITS NOT CREDITED

STEP 5

Complete the following to balance this statement to your new checkbook balance

BANK BALANCE SHOWN ON THIS STATEMENT $ ________

ADD DEPOSITS NOT CREDITED (if any) + ________

SUBTOTAL = $ ________

SUBTRACT CHECKS OUTSTANDING (if any) − ________

TOTAL = $ ________

*Total above should agree with your new checkbook balance.

LIST CHECKS OUTSTANDING	
TOTAL	$

XI. Advantages of a checking account

A. Provides a convenient way to pay bills

B. Provides a record of money spent

C. Protects money from loss or theft

D. Is usually accepted as proof of payment by law

(NOTE: Keep all cancelled checks for five years.)

XII. Types of checking accounts

(NOTE: There are considerable differences among lending institutions on minimum balance requirements, service charges, and interest paid on checking accounts.)

A. Regular checking

(NOTE: Regular checking accounts usually have a minimum balance requirement that must be maintained or a service charge or maintenance fee must be paid. Some accounts may have a charge per check or deposit. No interest is paid on the account balance.)

EXAMPLES: Check-A-Time; "ABC" Checking; Save N'Check; Basic Checking; Good Friends Checking

B. Interest-on-checking

INFORMATION SHEET

(NOTE: Interest-on-checking accounts may have a minimum balance requirement that must be maintained before interest will be paid on the account balance. There is a service charge if the minimum balance requirement is not maintained. Some accounts may limit the number of checks that can be written each month.)

EXAMPLES: NOW; Super NOW; Insured Money Market

C. Commercial checking

(NOTE: Commercial checking accounts are for businesses. Most accounts have a basic maintenance charge plus charges per check and deposit. Accounts usually receive an earnings credit based on a rate established by the financial institution.)

XIII. Steps to take when opening a checking account

A. Fill out signature card, giving personal information

EXAMPLES: Name, address, phone number, social security number

B. Sign your name on signature card as it will be written on your checks

(NOTE: Minor children's accounts require the signature of a parent or guardian.)

C. Fill out checking account deposit slip

(NOTE: List all checks, currency [bills], and coin to be deposited. Be sure to endorse checks.)

D. Give completed form to person opening your account

E. Order checks printed with your name and address

(NOTE: Printed checks cost extra, but businesses take them with fewer questions.)

F. Get a few blank checks to use until your checks are printed

XIV. Types of check endorsements and their descriptions (Figures 11 - 13)

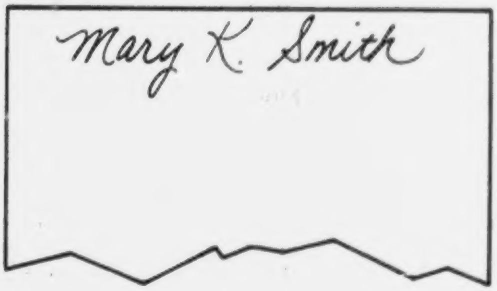
A. Blank endorsement — Payee signs name on back left-hand end of check

(NOTE: Anyone can cash a check endorsed in this manner. Never endorse a check written to you until you are ready to cash it.)

INFORMATION SHEET

EXAMPLE:

FIGURE 11

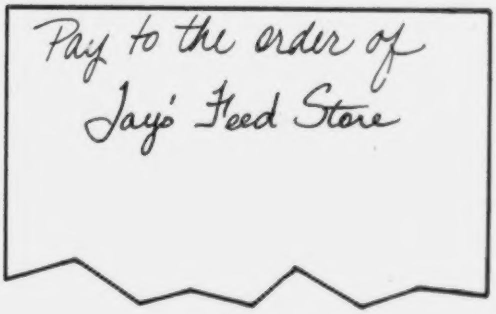


Mary K. Smith

B. Special endorsement — Payee writes *Pay to the order of* on back left-hand end of check

EXAMPLE:

FIGURE 12

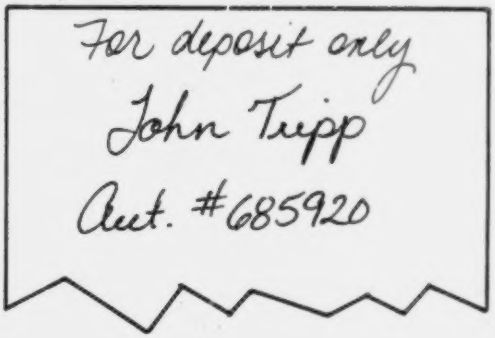


Pay to the order of
Jay's Feed Store

C. Restricted endorsement — Gives special directions such as *For deposit only* on back left-hand end of check

EXAMPLE:

FIGURE 13



For deposit only
John Tripp
Acct. #685920

INFORMATION SHEET

XV. Ways to request stop payment on a check

  A. In writing

  (NOTE: Written request for stop payment may be on a financial institution's form or in a letter. A fee may be charged.)

  B. By phone

  (NOTE: Phone requests for stop payment are temporary measures. To be legal, phone requests must be followed up by a written request.)

XVI. Points to remember when writing checks

  A. Write in ink

  B. Write clearly

  C. Fill in all blanks

  D. Use correct date

  E. Place decimal correctly

  F. Write amount close to dollar sign so that it cannot be changed

  G. Write amount in words as far to left as possible in space given; fill in unused portion with wavy line

  H. Do not cross out or erase on the check

  (NOTE: If you make a mistake, tear up the check and write another.)

  I. Never sign a blank check

XVII. Points to remember when writing deposit slips

  A. Write date on deposit slip

  B. Sign deposit slip to receive cash

  C. Write name and account number on deposit slip

  (NOTE: If you are using personalized checks, you will find in the back of your checkbook preprinted deposit slips with your name and account number, but you may use a plain deposit slip also.)

  D. Endorse all checks listed

  E. Get copy of deposit slip with bank stamp on it

  (NOTE: This stamped deposit slip is your proof that deposit was made. Do not forget to enter the deposit in your check register. If you make a deposit without a deposit slip, be sure to note on the receipt slip what the deposit was for.)

INFORMATION SHEET

XVIII. Reasons for keeping a check register

A. Shows balance at all times

B. Helps avoid overdrafts

C. Keeps record of checks written

D. Keeps record of deposits made

E. Shows dates of checks and deposits

F. Gives record to compare with checking-account statement

XIX. Reasons for reconciling a checking-account statement

(NOTE: It is important that you reconcile your checking-account statement every month. If you have a problem balancing your account, people at the financial institution can help you.)

A. A check you have written may not have arrived yet at the financial institution

B. A deposit may have been made after your statement was mailed

C. You may have made an error in arithmetic in your check register

D. Financial institution may have made an error

XX. Steps for reconciling a checking-account statement (Figures 14 - 21)

(NOTE: Compare the checking-account statement and your check register. When your check register total and the checking-account statement total agree [after subtractions and additions have been made], you have reconciled your check register with your checking-account statement. If you forget how to reconcile your statement, check the back of your statement for instructions.)

A. Subtract service charge from check register

EXAMPLE:

FIGURE 14

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

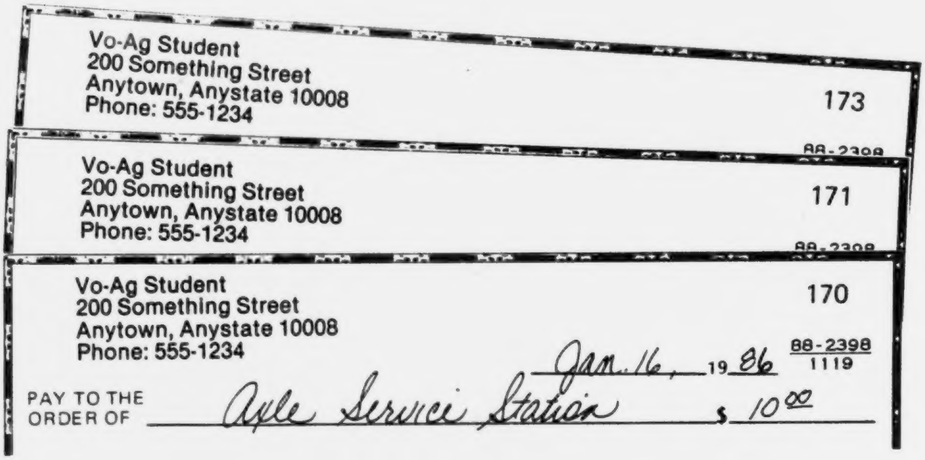
NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (−)		√ T	FEE (IF ANY) (−)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 174	00
173	1/22	ACME HARDWARE STORE	$ 34	00	✓	$	$		140	00
	1/28	DEPOSIT					100	00	240	00
		SERVICE CHARGE	5	00					235	00

INFORMATION SHEET

B. Arrange cancelled checks numerically

EXAMPLE:

FIGURE 15



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234
173

Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234
171

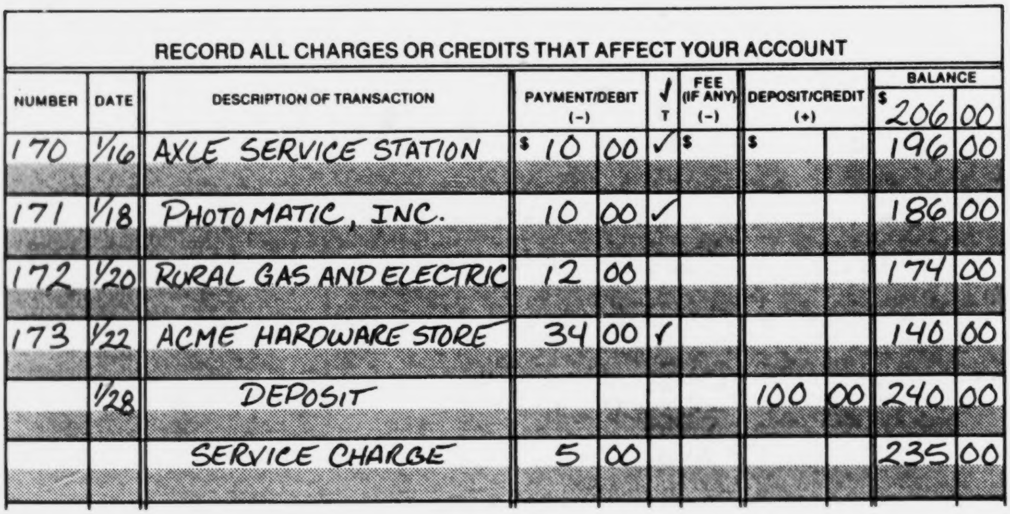
Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234
170
Jan. 16, 19 86
88-2398
1119
PAY TO THE ORDER OF Axle Service Station $ 10.00

C. Compare amounts of cancelled checks and deposits in checking-account statement with amounts written in check register

D. Check (✓) all cancelled checks and deposits in check register

EXAMPLE:

FIGURE 16



RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (-)		✓ T	FEE (IF ANY) (-)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 206	00
170	1/16	AXLE SERVICE STATION	$ 10	00	✓	$	$		196	00
171	1/18	PHOTOMATIC, INC.	10	00	✓				186	00
172	1/20	RURAL GAS AND ELECTRIC	12	00					174	00
173	1/22	ACME HARDWARE STORE	34	00	✓				140	00
	1/28	DEPOSIT					100	00	240	00
		SERVICE CHARGE	5	00					235	00

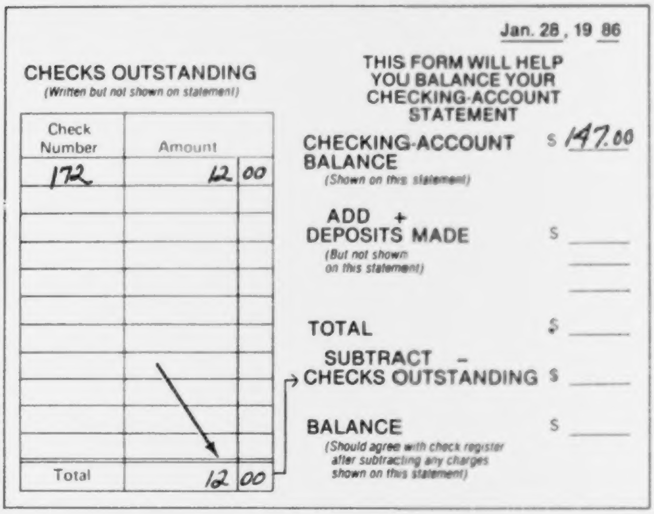
INFORMATION SHEET

E. List and add total outstanding checks (those not returned to bank or checked in your register)

(NOTE: List check number and amount of check.)

EXAMPLE:

FIGURE 17



Jan. 28, 19 86

CHECKS OUTSTANDING
(Written but not shown on statement)

Check Number	Amount	
172	12	00
Total	12	00

THIS FORM WILL HELP YOU BALANCE YOUR CHECKING-ACCOUNT STATEMENT

CHECKING-ACCOUNT BALANCE *(Shown on this statement)* $ 147.00

ADD + DEPOSITS MADE *(But not shown on this statement)* $ _____

TOTAL $ _____

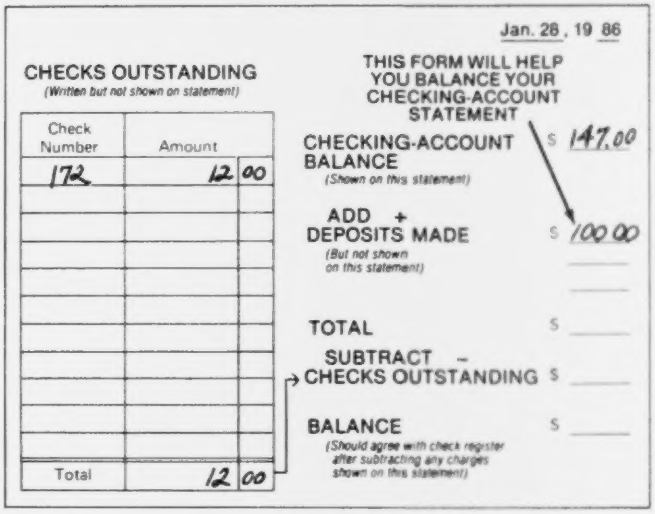
SUBTRACT − CHECKS OUTSTANDING $ _____

BALANCE *(Should agree with check register after subtracting any charges shown on this statement)* $ _____

F. Add and record total outstanding deposits

EXAMPLE:

FIGURE 18



Jan. 28, 19 86

CHECKS OUTSTANDING
(Written but not shown on statement)

Check Number	Amount	
172	12	00
Total	12	00

THIS FORM WILL HELP YOU BALANCE YOUR CHECKING-ACCOUNT STATEMENT

CHECKING-ACCOUNT BALANCE *(Shown on this statement)* $ 147.00

ADD + DEPOSITS MADE *(But not shown on this statement)* $ 100.00

TOTAL $ _____

SUBTRACT − CHECKS OUTSTANDING $ _____

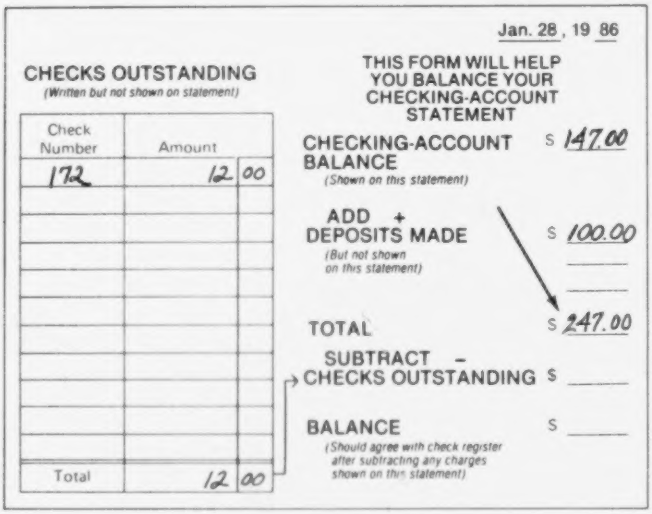
BALANCE *(Should agree with check register after subtracting any charges shown on this statement)* $ _____

INFORMATION SHEET

G. Add total outstanding deposits to balance shown on statement

EXAMPLE:

FIGURE 19



Jan. 28, 19 86

CHECKS OUTSTANDING
(Written but not shown on statement)

Check Number	Amount	
172	12	00
Total	12	00

THIS FORM WILL HELP YOU BALANCE YOUR CHECKING-ACCOUNT STATEMENT

CHECKING-ACCOUNT BALANCE *(Shown on this statement)* $ 147.00

ADD + DEPOSITS MADE *(But not shown on this statement)* $ 100.00

TOTAL $ 247.00

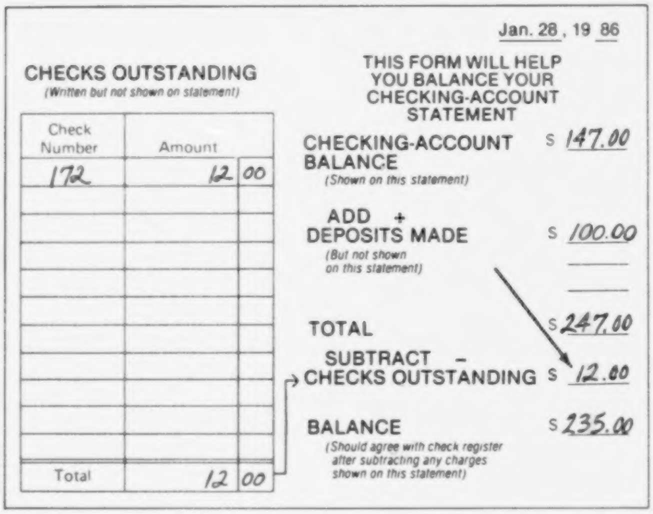
SUBTRACT − CHECKS OUTSTANDING $

BALANCE *(Should agree with check register after subtracting any charges shown on this statement)* $

H. Subtract total oustanding checks from total of checking-account balance and outstanding deposits

EXAMPLE:

FIGURE 20



Jan. 28, 19 86

CHECKS OUTSTANDING
(Written but not shown on statement)

Check Number	Amount	
172	12	00
Total	12	00

THIS FORM WILL HELP YOU BALANCE YOUR CHECKING-ACCOUNT STATEMENT

CHECKING-ACCOUNT BALANCE *(Shown on this statement)* $ 147.00

ADD + DEPOSITS MADE *(But not shown on this statement)* $ 100.00

TOTAL $ 247.00

SUBTRACT − CHECKS OUTSTANDING $ 12.00

BALANCE *(Should agree with check register after subtracting any charges shown on this statement)* $ 235.00

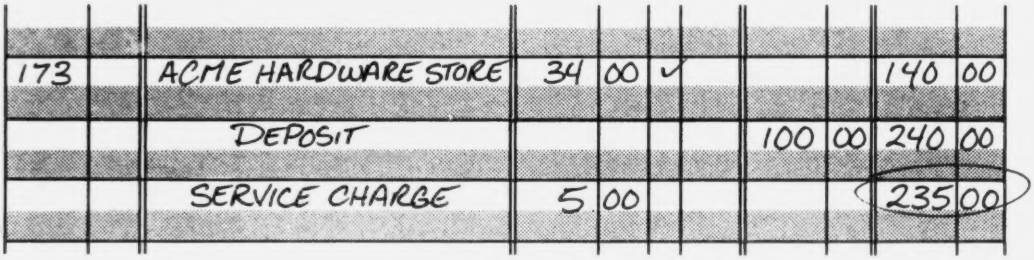
INFORMATION SHEET

I. Make sure that adjusted checking-account balance and adjusted check-register balance are equal

J. Circle check-register total to show that you agree with financial institution

EXAMPLE:

FIGURE 21



173		ACME HARDWARE STORE	34	00	✓				140	00
		DEPOSIT					100	00	240	00
		SERVICE CHARGE	5	00					235	00

HANDLE FINANCES
UNIT I

ASSIGNMENT SHEET #1 — DEVELOP A SAVINGS PLAN

NAME ______________________________ SCORE ______________

Saving is putting away money from present income for use sometime in the future. The greatest incentive to save is to achieve a purpose or goal, such as a class ring, senior pictures, the down payment on a car, and when you get older, the down payment on a house. The best way to save to achieve these important goals is to make a personal savings plan.

PART I

The first step in making a personal savings plan is to decide what your goals will be. To help you decide what your goals are, list the five biggest and most important items that you are going to need or want in the next year and their estimated costs. Examples of items you may choose include a class ring, car, or new coat.

	Item	Estimated cost
A.	______________________	______________
B.	______________________	______________
C.	______________________	______________
D.	______________________	______________
E.	______________________	______________

PART II

The next step in making a personal savings plan is to decide how you will save your money to reach the goals you have set for yourself. To guide you in learning the best ways to save money, answer each of the following questions on the blanks provided.

A. 1. If you have a job, will you save money from each paycheck? ______________

2. If yes, how much money will you save from each paycheck? ______________

3. If no, how will you accumulate the amount needed? ______________

____

B. 1. Do you see yourself taking a job, a second job or working extra hours at your present job?

____

2. Why or why not? ______________________________

____

ASSIGNMENT SHEET #1

C. 1. Do you see yourself involved in fewer school activities to obtain the items you need?

2. Why or why not?

D. 1. Where will you save your money and what method of saving will you choose?

2. Why have you chosen this place and method of saving?

E. 1. Do you think you can obtain these items?

2. Explain your answer.

HANDLE FINANCES
UNIT I

ASSIGNMENT SHEET #2 — WRITE CHECKS

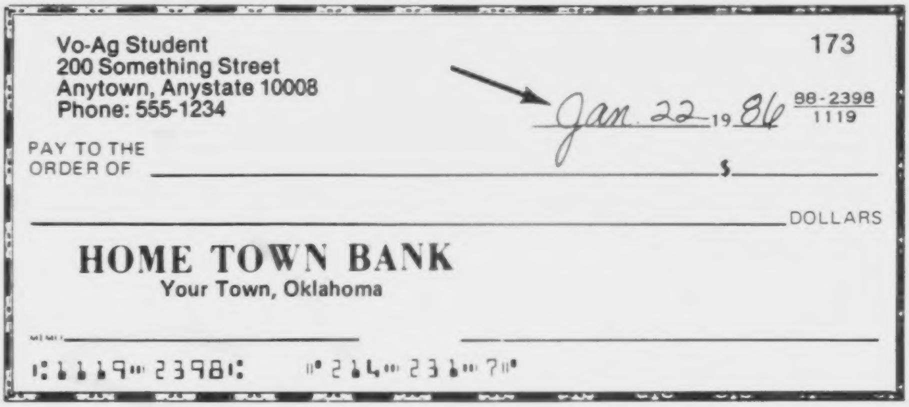
NAME ______________________________ SCORE ______________

Writing checks will most likely be an important part of your life. If you pay a person in cash, you count your money carefully because too much money paid out is a loss to you. For the same reason, it is important that you write checks carefully. For instance, if you are careless and forget a decimal point, a $10.00 check becomes a $1000 check. This assignment sheet will give you guidelines for writing checks and the practice in writing checks that you will need to help you avoid making careless mistakes that might result in overpayments.

Study the steps for writing a check that begin below in Part I, and then fill out the blank checks in Part II of this assignment sheet.

PART I: Steps in writing a check

A. Write in the correct date



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

173

Jan. 22 19 86

88-2398
1119

PAY TO THE ORDER OF ______________________ $ ________

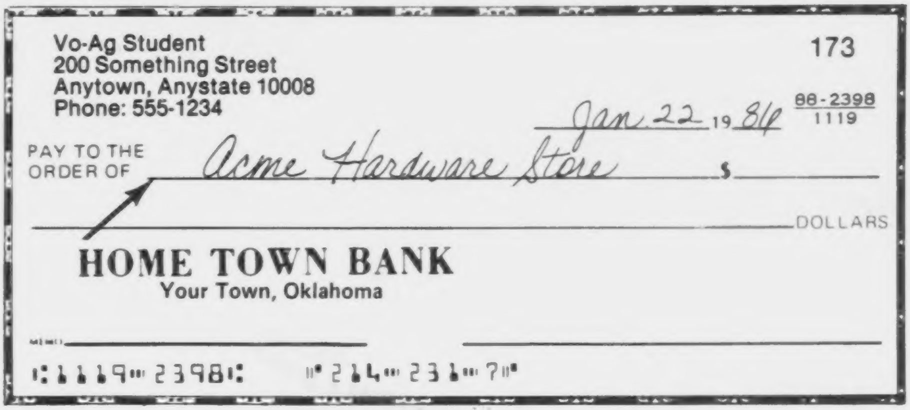
______________________________________ DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

MEMO ______________ ______________

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

B. Write in the name of the payee



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

173

Jan. 22 19 86

88-2398
1119

PAY TO THE ORDER OF Acme Hardware Store $ ________

______________________________________ DOLLARS

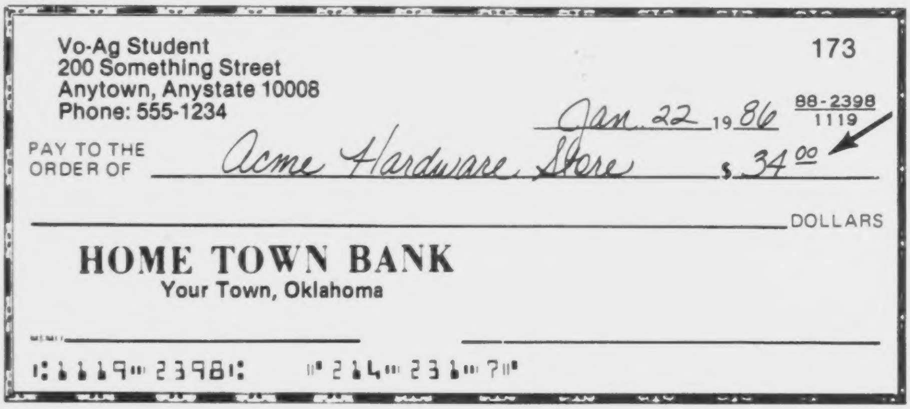
HOME TOWN BANK
Your Town, Oklahoma

MEMO ______________ ______________

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

ASSIGNMENT SHEET #2

C. Write in the amount of the check in numerals (numbers)



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

173

Jan. 22 19 86 88-2398/1119

PAY TO THE ORDER OF Acme Hardware Store $ 34^{00}

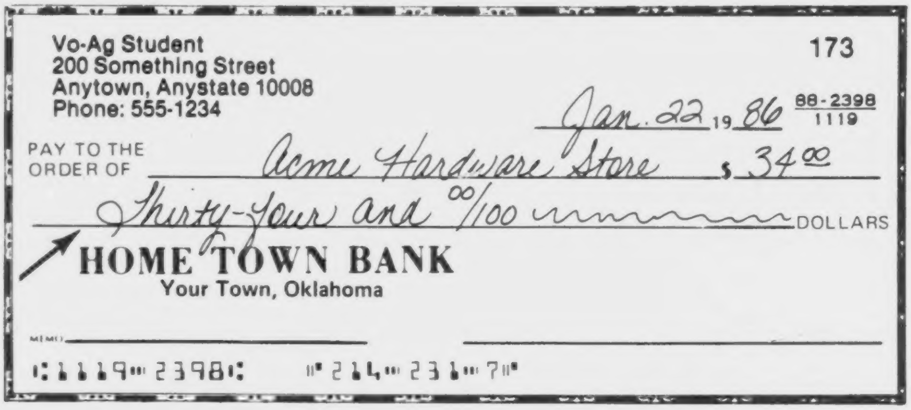
DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

MEMO

⑆1119⑉2398⑆ ⑈214⑉231⑉7⑈

D. Write in the amount of the check in words



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

173

Jan. 22 19 86 88-2398/1119

PAY TO THE ORDER OF Acme Hardware Store $ 34^{00}

Thirty-four and 00/100 DOLLARS

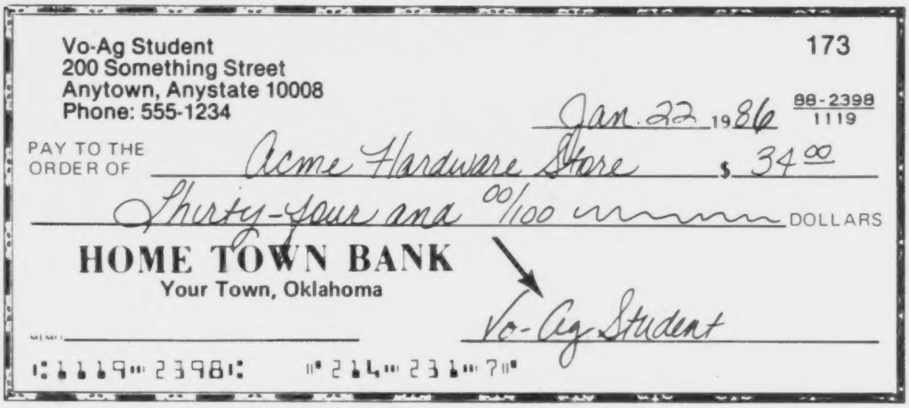
HOME TOWN BANK
Your Town, Oklahoma

MEMO

⑆1119⑉2398⑆ ⑈214⑉231⑉7⑈

E. Write your signature on the check

(NOTE: Every person who has a checking account must sign a signature card at the financial institution. Every time you write a check, you must sign your signature exactly the way your name appears on the signature card.)



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

173

Jan. 22 19 86 88-2398/1119

PAY TO THE ORDER OF Acme Hardware Store $ 34^{00}

Thirty-four and 00/100 DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

MEMO

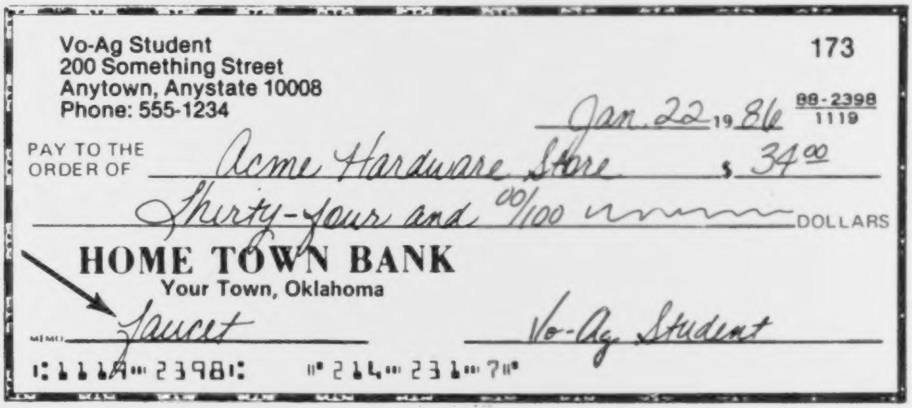
Vo-Ag Student

⑆1119⑉2398⑆ ⑈214⑉231⑉7⑈

ASSIGNMENT SHEET #2

F. Write in the reason why the check is written

(NOTE: After the check is written, be sure to write the check number, the amount, and to whom the check was paid on the check stub or check register in your checkbook.)



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

173

Jan. 22 19 86 88-2398/1119

PAY TO THE ORDER OF Acme Hardware Store $ 34 00

Thirty-four and 00/100 ~~~~~~ DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

MEMO Faucet Vo-Ag Student

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

PART II: Writing checks

Using the steps for writing checks you learned in Part I, fill in the following blank checks with the information provided above each check. Be sure to write each check in ink, fill in all spaces, and write clearly.

A. *Date*: January 7, 1986

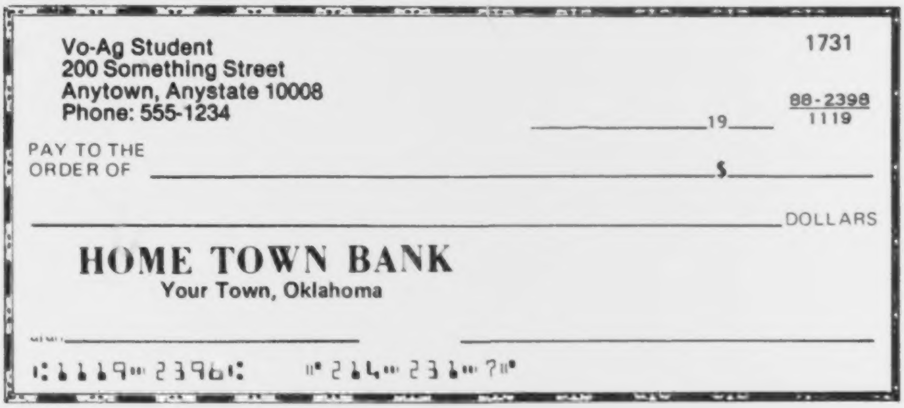
Payee: Carter Hardware

Amount: $50.00

Amount written: Fifty and 00/100 ~~~~ dollars

Signature: Your name

Memo: For lumber



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1731

______ 19 ___ 88-2398/1119

PAY TO THE ORDER OF ______ $ ______

______ DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

MEMO ______ ______

⑆1119⑈2396⑆ ⑈214⑈231⑈7⑈

ASSIGNMENT SHEET #2

B. *Date*: January 10, 1986

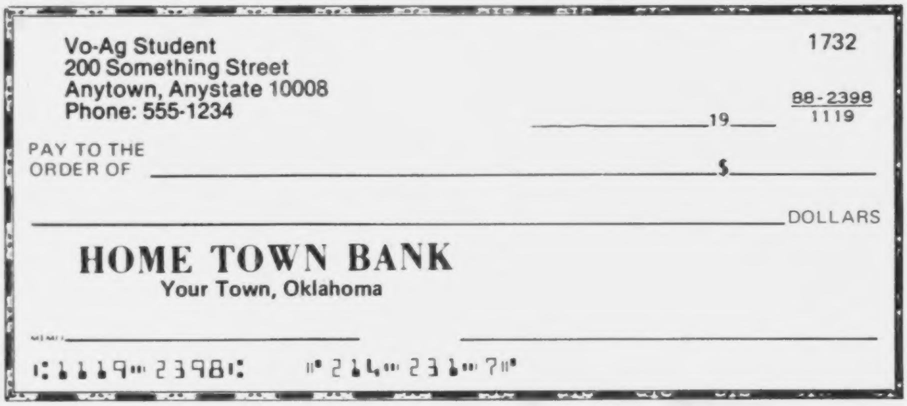
Payee: Ace Plumbing Company

Amount: $23.52

Amount written: Twenty-three and 52/100 ~~~~~ dollars

Signature: Your name

Memo: Faucets



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1732

88-2398
1119

________________19____

PAY TO THE
ORDER OF ______________________________$__________

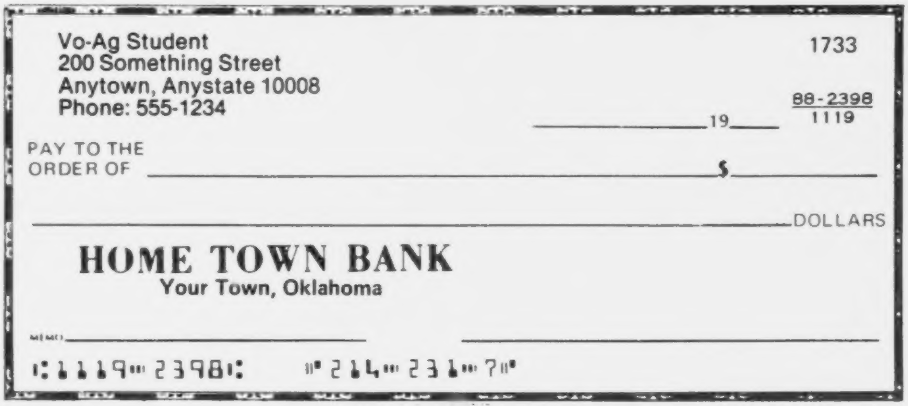
______________________________DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

MEMO ______________ ______________

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

C. On January 11, 1986, you purchased 500 pounds of 18 percent hog ration for your FFA swine project. Write the check below to Smith's Feed Store for $55.45.



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1733

88-2398
1119

________________19____

PAY TO THE
ORDER OF ______________________________$__________

______________________________DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

MEMO ______________ ______________

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

ASSIGNMENT SHEET #2

D. Your younger brother had a wreck on his bicycle. He broke his front wheel rim. You felt sorry for him, and on January 12, 1986, you bought him a new rim. Write a check to Jim Jones' Bike Repair Shop for $16.57.

Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1734

88-2398
1119

________________19____

PAY TO THE
ORDER OF ______________________________ $__________

____ DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

MEMO________________ ________________________

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

E. You are planning to go to the high school basketball game but are short of cash. You stop at the Quick Stop food store and purchase $2.00 worth of gas. You write a check for $10.00. Fill out the check as you would for the food store puchase. The date is January 18, 1986.

Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1735

88-2398
1119

________________19____

PAY TO THE
ORDER OF ______________________________ $__________

____ DOLLARS

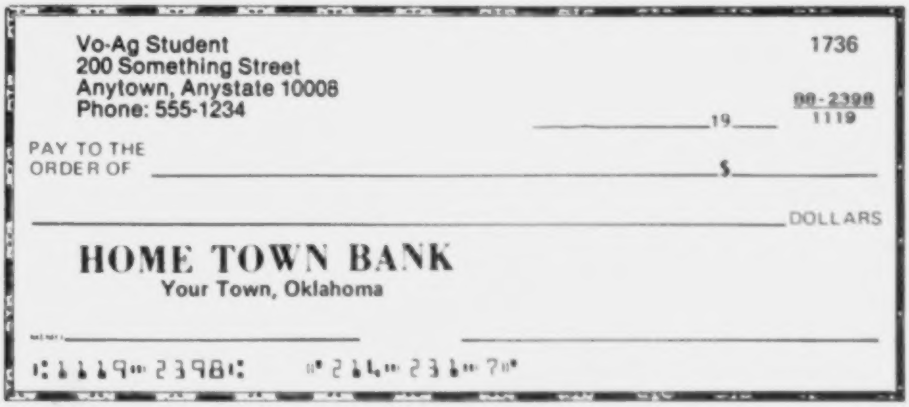
HOME TOWN BANK
Your Town, Oklahoma

MEMO________________ ________________________

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

ASSIGNMENT SHEET #2

F. You need to build a portable farrowing house for your FFA swine project. You go to Anderson's Lumber Company to buy nails and lumber for the farrowing house. The materials cost $75.13. Write the check as you would for the lumber company purchase. The date is January 21, 1986.



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1736

88-2398
1119

________________ 19____

PAY TO THE ORDER OF ____________________________ $__________

____ DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

__________________ ____________________

⑆1119⑈ 2398⑆ ⑈214⑈ 231⑈ 7⑈

HANDLE FINANCES
UNIT I

ASSIGNMENT SHEET #3 — WRITE DEPOSIT SLIPS

NAME ______________________ SCORE __________

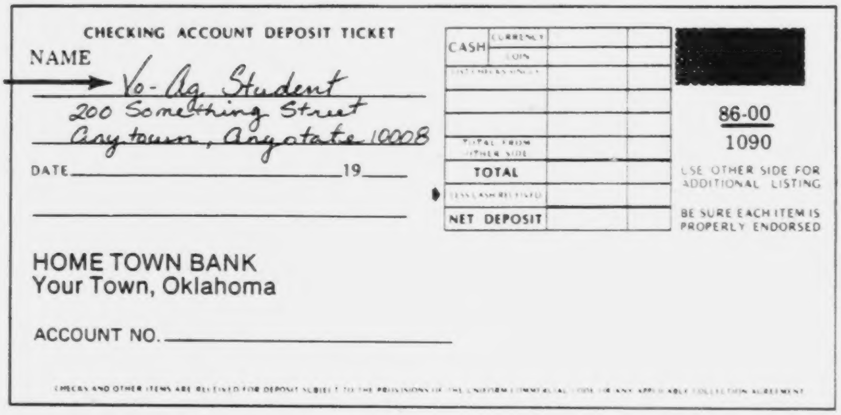
Your deposit slip is very important to you because it is your record of the money and checks you deposit in your financial institution; therefore, you must fill out deposit slips carefully and clearly.

Study the steps for writing a deposit slip that begin below in Part I, and then fill out the blank deposit slips in Part II of this assignment sheet.

PART I: Steps in writing a deposit slip

(NOTE: In the following example, $50.00 in bills, $3.00 in coin, a check for $15.00, and a check for 100.00 will be deposited.)

A. Write in your name and address in ink



CHECKING ACCOUNT DEPOSIT TICKET

NAME
Vo-Ag Student
200 Something Street
Anytown, Anystate 10008

DATE ______________ 19____

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. ____________

CASH	CURRENCY		
	COIN		
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

[redacted]

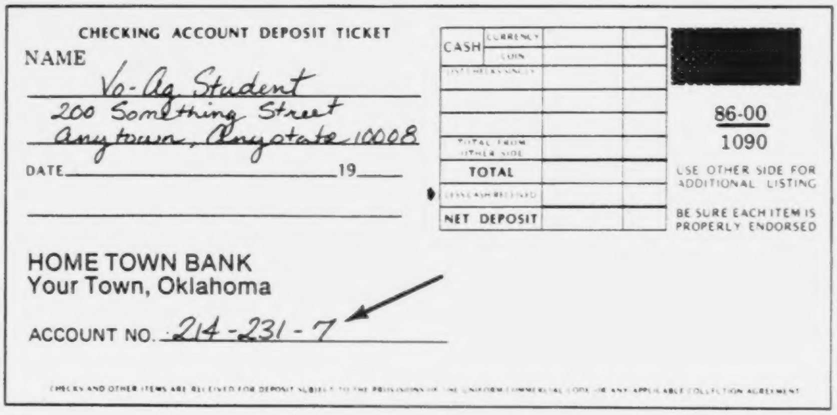
86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

B. Write in your account number



CHECKING ACCOUNT DEPOSIT TICKET

NAME
Vo-Ag Student
200 Something Street
Anytown, Anystate 10008

DATE ______________ 19____

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CASH	CURRENCY		
	COIN		
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

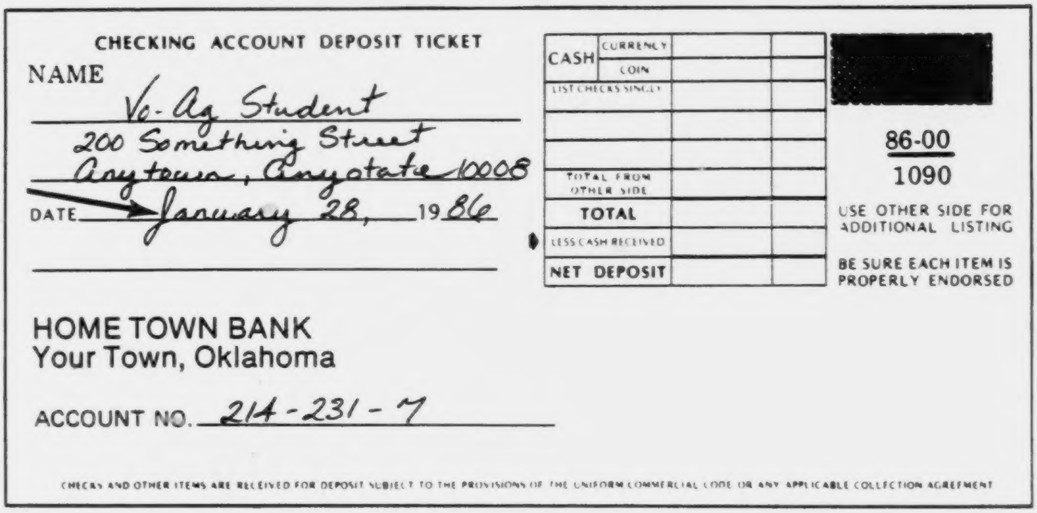
BE SURE EACH ITEM IS PROPERLY ENDORSED

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

BEST COPY AVAILABLE

ASSIGNMENT SHEET #3

C. Write in the date



CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
DATE January 28, 1986

CASH	CURRENCY		
	COIN		
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

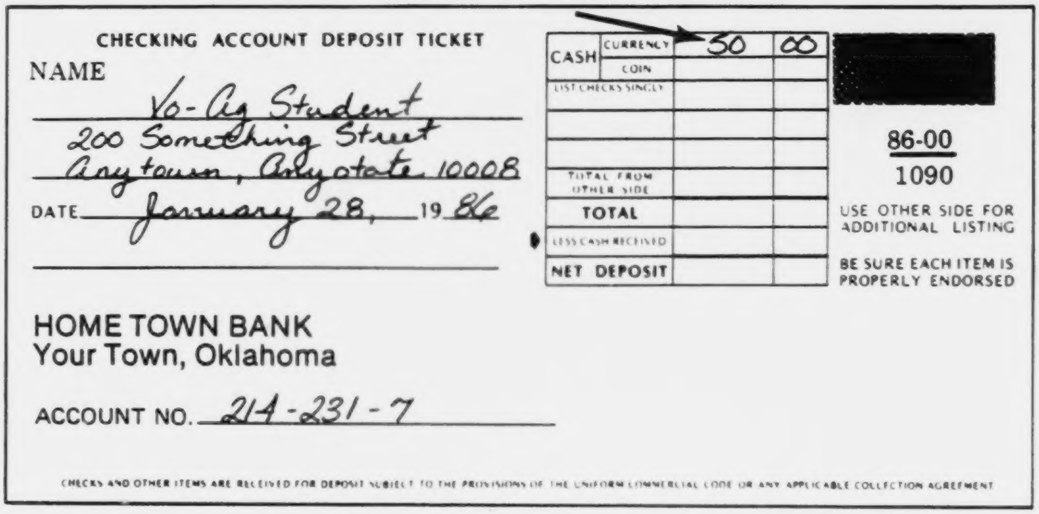
BE SURE EACH ITEM IS PROPERLY ENDORSED

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

D. List the total amount you are depositing in currency (bills)



CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
DATE January 28, 1986

CASH	CURRENCY	50	00
	COIN		
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

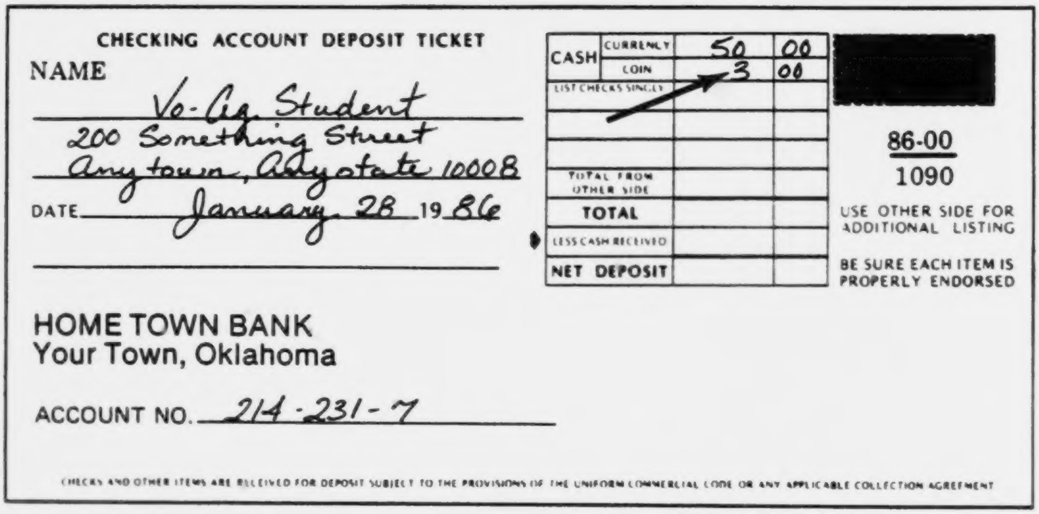
HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

ASSIGNMENT SHEET #3

E. List the total amount you are depositing in coin



CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student
200 Something Street
Anytown, Anystate 10008

DATE January 28 19 86

CASH	CURRENCY	50	00
	COIN	3	00
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

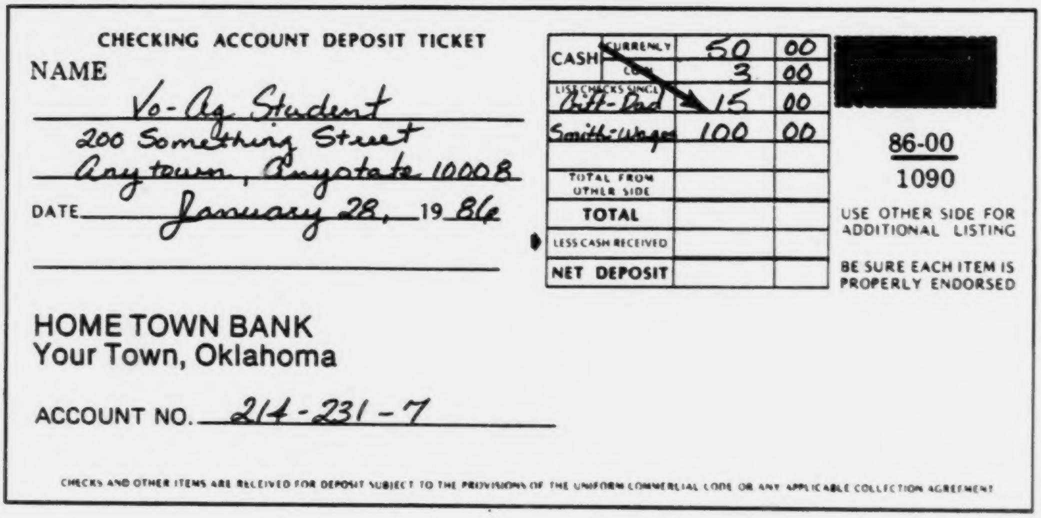
HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

F. Endorse each check and list each check separately on the deposit slip

(NOTE: If more space is needed for listing checks than is given on front of deposit slip, checks may be listed on the back of the slip.)



CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student
200 Something Street
Anytown, Anystate 10008

DATE January 28, 19 86

CASH	CURRENCY	50	00
	COIN	3	00
LIST CHECKS SINGLY Gift-Dad		15	00
Smith-Wages		100	00
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

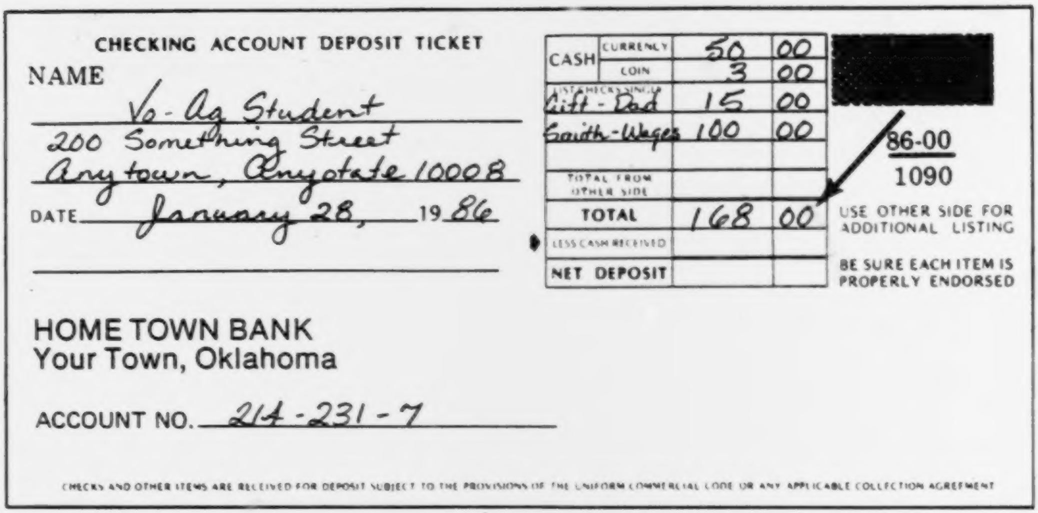
HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

ASSIGNMENT SHEET #3

G. Add the amounts listed for checks, currency, and coin, and enter that figure in the space after TOTAL



CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student
200 Something Street
Anytown, Anystate 10008

DATE January 28, 19 86

CASH	CURRENCY	50	00
	COIN	3	00
LIST CHECKS SINGLY	Gift - Dad	15	00
	Smith-Wages	100	00
TOTAL FROM OTHER SIDE			
TOTAL		168	00
LESS CASH RECEIVED			
NET DEPOSIT			

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

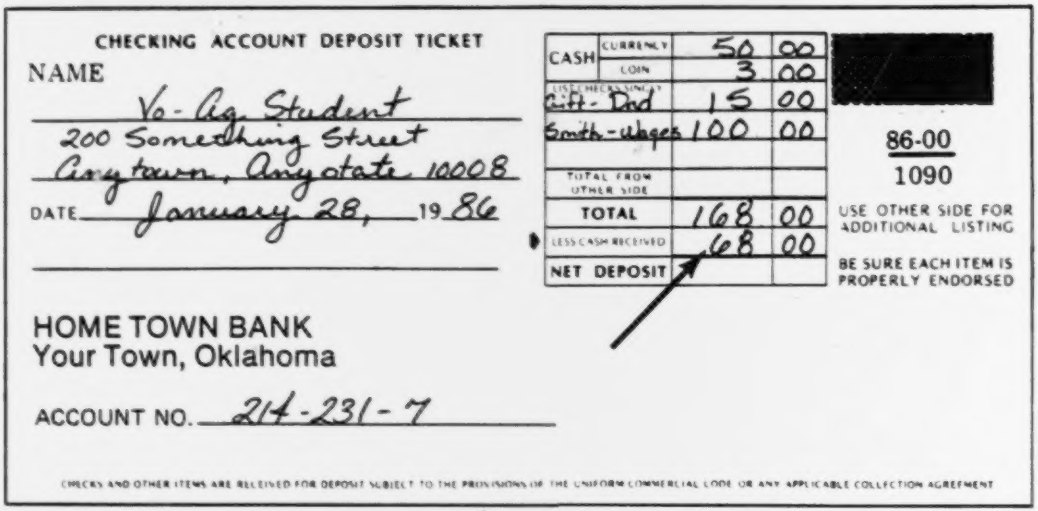
HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

H. Write in the amount of cash you desire to keep from the deposit in the space after LESS CASH RECEIVED

(NOTE: This step and the next two are necessary only if you are depositing a check or checks and wish to deposit part of the value and receive part of the value in cash. If depositing in a savings account, you must write in "Less cash" and the amount desired.)



CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student
200 Something Street
Anytown, Anystate 10008

DATE January 28, 19 86

CASH	CURRENCY	50	00
	COIN	3	00
LIST CHECKS SINGLY	Gift - Dad	15	00
	Smith-Wages	100	00
TOTAL FROM OTHER SIDE			
TOTAL		168	00
LESS CASH RECEIVED		68	00
NET DEPOSIT			

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

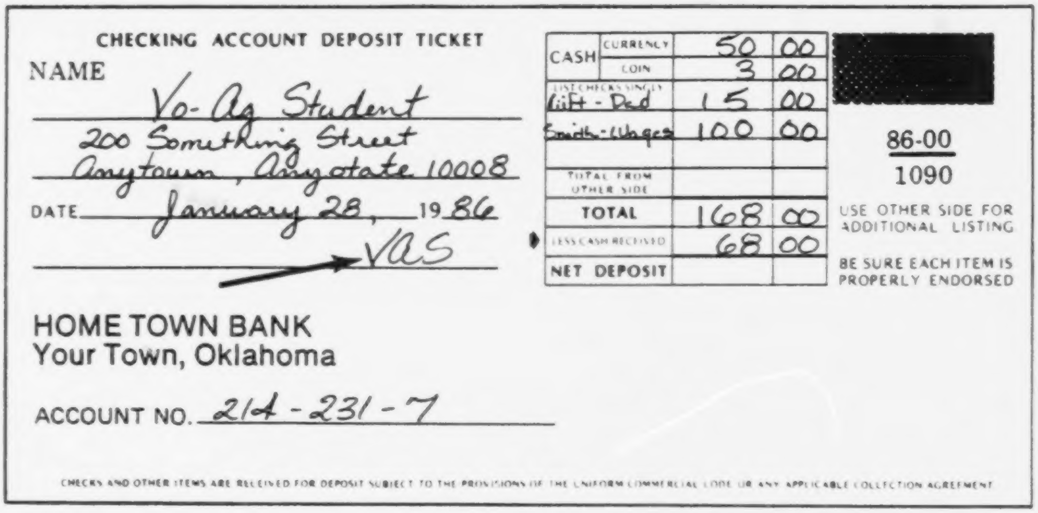
HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

ASSIGNMENT SHEET #3

I. Sign your name or initials in the space opposite LESS CASH RECEIVED



CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
DATE January 28, 19 86
VAS

CASH	CURRENCY	50	00
	COIN	3	00
LIST CHECKS SINGLY	Gift - Dad	15	00
	Smith - Wages	100	00
TOTAL FROM OTHER SIDE			
TOTAL		168	00
LESS CASH RECEIVED		68	00
NET DEPOSIT			

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

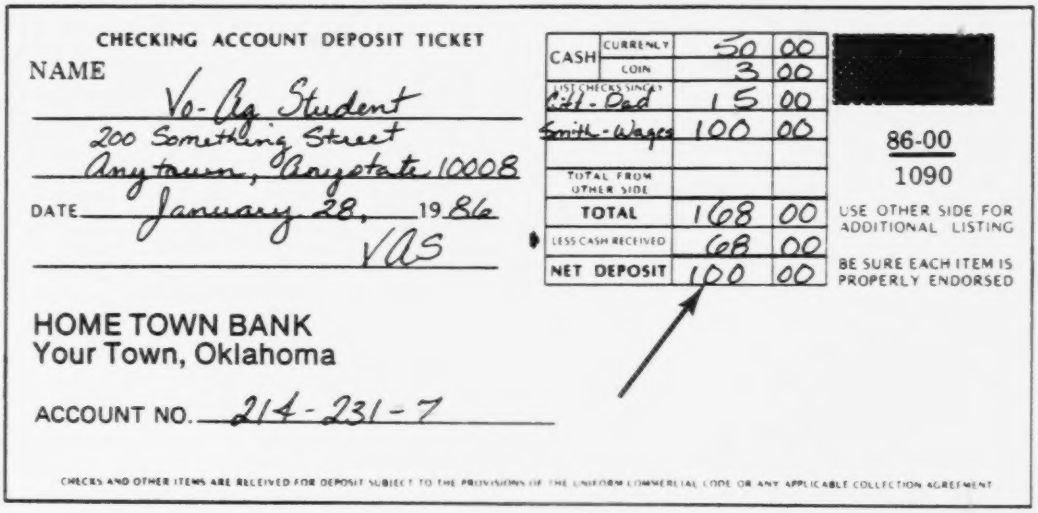
BE SURE EACH ITEM IS PROPERLY ENDORSED

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

J. Subtract the amount of cash desired from TOTAL, and enter as NET DEPOSIT or TOTAL DEPOSIT



CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
DATE January 28, 19 86
VAS

CASH	CURRENCY	50	00
	COIN	3	00
LIST CHECKS SINGLY	Gift - Dad	15	00
	Smith - Wages	100	00
TOTAL FROM OTHER SIDE			
TOTAL		168	00
LESS CASH RECEIVED		68	00
NET DEPOSIT		100	00

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

ASSIGNMENT SHEET #3

PART II: Writing deposit slips

Following the steps for writing deposit slips you learned in Part I, fill in the following blank deposit slips with the information provided above each deposit slip. Be sure to write in ink, fill in all spaces, and write clearly.

A.	*Your account number*:	214-231-7
	Date:	January 6, 1986
	Currency (bills):	$ 5.00
	Coin:	$ 1.35
	Check for wages from Smith's Feed Store:	$100.00

CHECKING ACCOUNT DEPOSIT TICKET

NAME ______________________________

____

DATE ____________________ 19____

____

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. ______________________

CASH	CURRENCY		
	COIN		
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

ASSIGNMENT SHEET #3

B. *Your account number*:	214-231-7
Date:	January 20, 1986
Check for wages from Smith's Feed Store:	$100.00
Cash you need withheld from deposit:	$ 25.00

CHECKING ACCOUNT DEPOSIT TICKET

NAME ______________________________

____

DATE ______________________ 19____

____

CASH	CURRENCY		
	COIN		
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. ______________________

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

ASSIGNMENT SHEET #3

C. The date is January 30, 1986. Over the last week you have sold feeder pigs from your FFA swine project to several persons, and they all paid you by check.

Joe Burns: two pigs, with check totaling $110.00
Freddie Fisher: one registered gilt, with check totaling $100.00
Larry Longfellow: twenty-one pigs, with check totaling $1050.00
John Brown: one registered gilt, with check totaling $125.00

Also, Aunt Kathy sent you a check for $10.00 for your birthday, and you sold your shotgun to Brain Foster for $135.00. He paid you with a check. You want to deposit in your checking account all but $20.00, which the bank will return to you in cash. Your account number is 214-231-7.

CHECKS LIST SINGLY	DOLLARS	CENTS
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
TOTAL		

ENTER TOTAL ON THE FRONT OT THIS TICKET

CHECKING ACCOUNT DEPOSIT TICKET

NAME ______________________________

____

DATE ______________________ 19____

____

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. ______________________

CASH	CURRENCY		
	COIN		
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE			
TOTAL			
LESS CASH RECEIVED			
NET DEPOSIT			

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

HANDLE FINANCES
UNIT I

ASSIGNMENT SHEET #4 — COMPLETE A CHECK REGISTER

NAME ____________________ SCORE __________

A check register is a small booklet used to keep a record of deposits made and checks written on your account so that you can tell at a glance the amount of money you have in your checking account. The steps for entering checks, deposits, and service charges in a checkbook register are given in Part I of this assignment sheet. Study the steps for completing a check register, and then practice the steps you have learned by filling out the blank check register in Part II of the assignment sheet. Be sure to fill in the check register in ink and write clearly.

PART I: Steps for entering checks, deposits, and service charges in a check register

A. Steps for entering the checks written on your account

1. Write in the check number

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (-)	✓ T	FEE (IF ANY) (-)	DEPOSIT/CREDIT (+)	BALANCE
							$ 174 00
173			$		$	$	

2. Write in the date

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (-)	✓ T	FEE (IF ANY) (-)	DEPOSIT/CREDIT (+)	BALANCE
							$ 174 00
173	1/22		$		$	$	

3. Write in the name of the person or business to whom the check was written

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (-)	✓ T	FEE (IF ANY) (-)	DEPOSIT/CREDIT (+)	BALANCE
							$ 174 00
173	1/22	ACME HARDWARE STORE	$		$	$	

ASSIGNMENT SHEET #4

4. Write in the amount of the check in the correct column

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (−)		✓ T	FEE (IF ANY) (−)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 174	00
173	1/22	ACME HARDWARE STORE	$ 34	00		$	$			

5. On scratch paper or with a calculator, subtract the amount of the check from the balance

6. Write in the new balance on the check register

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (−)		✓ T	FEE (IF ANY) (−)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 174	00
173	1/22	ACME HARDWARE STORE	$ 34	00		$	$		140	00

7. Repeat steps 1 through 6 each time you write a check

B. Steps for entering deposits made to your account

1. Write in the date

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (−)		✓ T	FEE (IF ANY) (−)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 174	00
173	1/22	ACME HARDWARE STORE	$ 34	00		$	$		140	00
	1/28									

ASSIGNMENT SHEET #4

2. Write the word "Deposit" on the line under DESCRIPTION OF TRANSACTION

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (–)		√ T	FEE (IF ANY) (–)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 174	00
173	1/22	ACME HARDWARE STORE	$ 34	00		$	$		140	00
	1/28	DEPOSIT								

3. Write in the amount of the deposit in the proper column

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (–)		√ T	FEE (IF ANY) (–)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 174	00
173	1/22	ACME HARDWARE STORE	$ 34	00		$	$		140	00
	1/28	DEPOSIT					100	00		

4. On scratch paper or with a calculator, add the amount of the deposit to the balance

5. Write in the new balance on the check register

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (–)		√ T	FEE (IF ANY) (–)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 174	00
173	1/22	ACME HARDWARE STORE	$ 34	00		$	$		140	00
	1/28	DEPOSIT					100	00	240	00

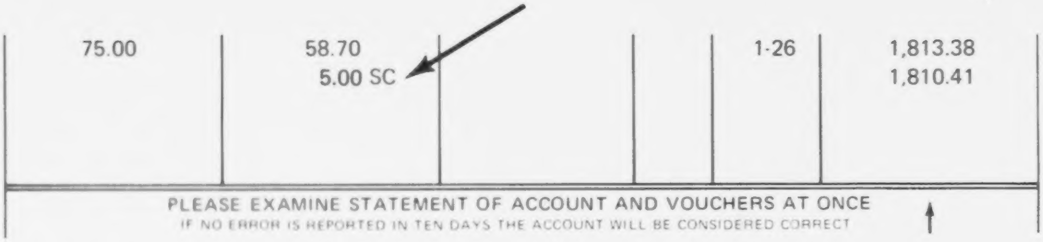
6. Repeat steps 1 through 5 each a time you make a deposit

ASSIGNMENT SHEET #4

C. Steps for entering service charges

1. Locate the abbreviation *SC* on your checking-account statement

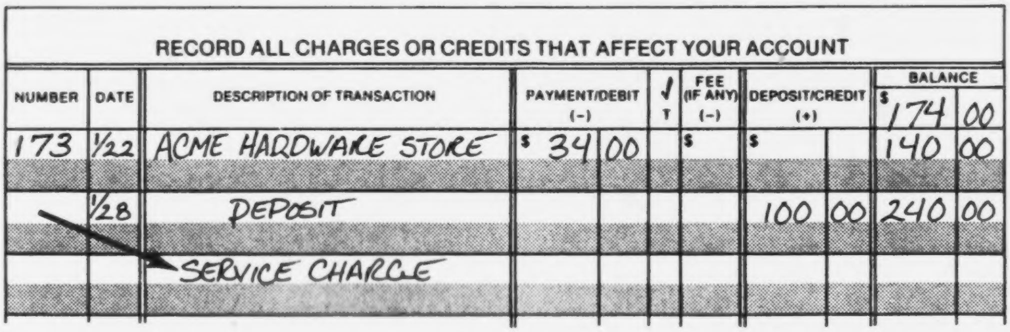
   (NOTE: *SC* is an abbreviation for your monthly service charge.)



75.00	58.70 5.00 SC			1-26	1,813.38 1,810.41

PLEASE EXAMINE STATEMENT OF ACCOUNT AND VOUCHERS AT ONCE
IF NO ERROR IS REPORTED IN TEN DAYS THE ACCOUNT WILL BE CONSIDERED CORRECT

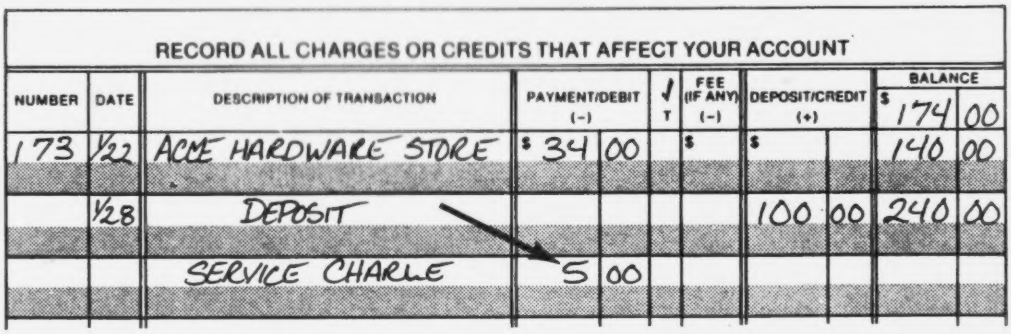
2. Write "Service Charge" on the line under DESCRIPTION OF TRANSACTION in your check register



RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (-)		✓ T	FEE (IF ANY) (-)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 174	00
173	1/22	ACME HARDWARE STORE	$ 34	00		$	$		140	00
	1/28	DEPOSIT					100	00	240	00
		SERVICE CHARGE								

3. Write in the amount of the service charge in the correct column



RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (-)		✓ T	FEE (IF ANY) (-)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 174	00
173	1/22	ACME HARDWARE STORE	$ 34	00		$	$		140	00
	1/28	DEPOSIT					100	00	240	00
		SERVICE CHARGE	5	00						

4. On scratch paper or with a calculator, subtract the service charge from the balance

ASSIGNMENT SHEET #4

5. Write in the new balance in your check register

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (−)		√ T	FEE (IF ANY) (−)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 174	00
173	1/22	ACME HARDWARE STORE	$ 34	00		$	$		140	00
	1/28	DEPOSIT					100	00	240	00
		SERVICE CHARGE	5	00					235	00

PART II

See Part II, questions A through F, in Assignment Sheet #2, and Part II, questions A through C, in Assignment Sheet #3. Using those six checks and three deposit slips, complete the check register below by recording all checks written and checking deposits made. Assume that you have a beginning balance of $126.14.

(NOTE: When you are writing real checks or making real deposits, always record the amount in your check register at once.)

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (−)		√ T	FEE (IF ANY) (−)	DEPOSIT/CREDIT (+)		BALANCE	
									$	
			$			$	$			

HANDLE FINANCES
UNIT I

ASSIGNMENT SHEET #5 — RECONCILE A CHECKING-ACCOUNT STATEMENT

NAME ______________________________ SCORE ______________

At the end of each month, you will receive a checking-account statement from your financial institution. This statement will tell you how much money you have in your checking account. Every month, you must reconcile your checking-account statement—make sure the balance in your check register agrees with the balance on your checking-account statement—so that you can detect any errors you may have made in your check register or any errors the financial institution may have made.

To help you practice reconciling a checking-account statement, first review Section XX of the Information Sheet, and then complete Parts I and II of this assignment sheet.

PART I

Study the checking account statement below and the case study presented, and then fill out the back of the checking-account statement on the following page. Be sure to subtract service charge from check register.

> Case study: Sam Levin's checkbook balance on June 30 was $482.35. His June 30 checking-account statement showed a balance of $512.36. There is a service charge of $1.75 for June, which had not been recorded in the check register. The following checks were outstanding: No. 69 for $3.87; No. 71 for $15.95; No. 74 for $7.68; and No. 75 for $4.26.

CHECKING-ACCOUNT STATEMENT
Date of Statement: June 30, 1986

DATE	#	CHECK	DEPOSITS	BALANCE
6-1-86				484.43
6-3-86	70	14.00		470.43
6-10-86			50.00	520.43
6-16-86	73	6.32		514.11
6-29-86		1.75 SC		512.36

LAST AMOUNT IN THIS COLUMN IS YOUR BALANCE ↑

ASSIGNMENT SHEET #5

JUNE 30, 19 86

CHECKS OUTSTANDING
(Written but not shown on statement)

Check Number	Amount	
Total		

THIS FORM WILL HELP YOU BALANCE YOUR CHECKING-ACCOUNT STATEMENT

CHECKING-ACCOUNT BALANCE $ ______
(Shown on this statement)

ADD +
DEPOSITS MADE $ ______
(But not shown on this statement)
______
______

TOTAL $ ______

SUBTRACT −
CHECKS OUTSTANDING $ ______

BALANCE $ ______
(Should agree with check register after subtracting any charges shown on this statement)

PART II

Study the checking-account statement on the following page, and using the check register you completed in Part II of Assignment Sheet #4, reconcile that check register with the checking-account statement. Refer to Section XX of the Information Sheet if necessary, and then fill out the back of the checking-account statement on the following page. Be sure to subtract service charge from check register.

ASSIGNMENT SHEET #5

CHECKING-ACCOUNT STATEMENT
Date of Statement: January 30, 1986

DATE	#	CHECK	DEPOSITS	BALANCE
1-1-86		Balance Forward		126.14
1-6-86			106.35	232.49
1-7-86	1731	50.00		182.49
1-10-86	1732	23.52		158.97
1-11-86	1733	55.45		103.52
1-20-86			75.00	178.52
1-21-86	1736	75.13		103.39
		4.82 SC		98.57

LAST AMOUNT IN THIS COLUMN IS YOUR BALANCE ↑

Jan. 28, 19 86

CHECKS OUTSTANDING
(Written but not shown on statement)

Check Number	Amount	
Total		

THIS FORM WILL HELP YOU BALANCE YOUR CHECKING-ACCOUNT STATEMENT

CHECKING-ACCOUNT BALANCE $ ______
(Shown on this statement)

ADD + DEPOSITS MADE $ ______
(But not shown on this statement)
______
______

TOTAL $ ______

SUBTRACT − CHECKS OUTSTANDING $ ______

BALANCE $ ______
(Should agree with check register after subtracting any charges shown on this statement)

HANDLE FINANCES
UNIT I

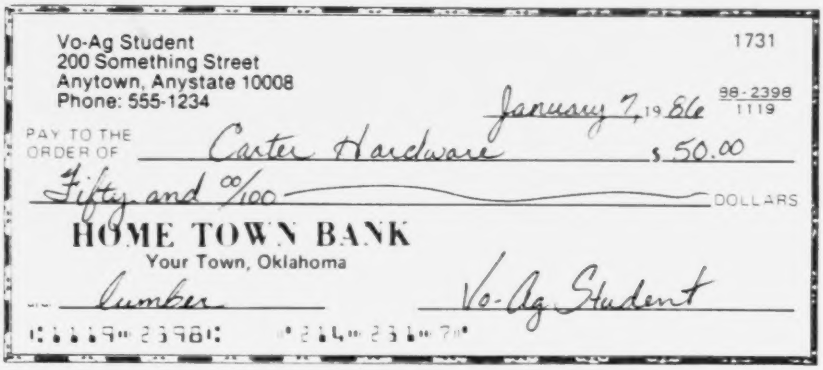
ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1 — Evaluated to the satisfaction of the instructor

Assignment Sheet #2

PART II

A.



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1731

January 7, 19 86

98-2398
1119

PAY TO THE ORDER OF Carter Hardware $ 50.00

Fifty and 00/100 DOLLARS

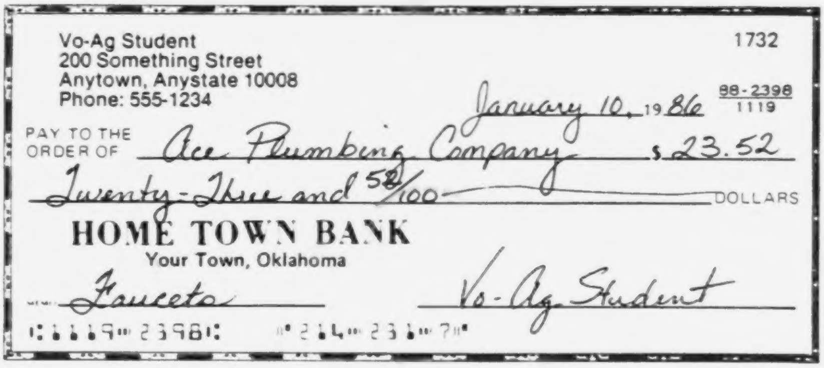
HOME TOWN BANK
Your Town, Oklahoma

lumber

Vo-Ag Student

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

B.



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1732

January 10, 19 86

98-2398
1119

PAY TO THE ORDER OF Ace Plumbing Company $ 23.52

Twenty-Three and 52/100 DOLLARS

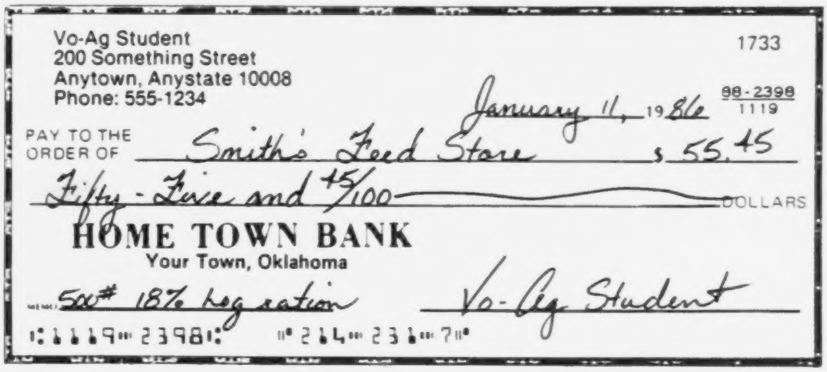
HOME TOWN BANK
Your Town, Oklahoma

Faucets

Vo-Ag Student

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

C.



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1733

January 11, 19 86

98-2398
1119

PAY TO THE ORDER OF Smith's Feed Store $ 55.45

Fifty-Five and 45/100 DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

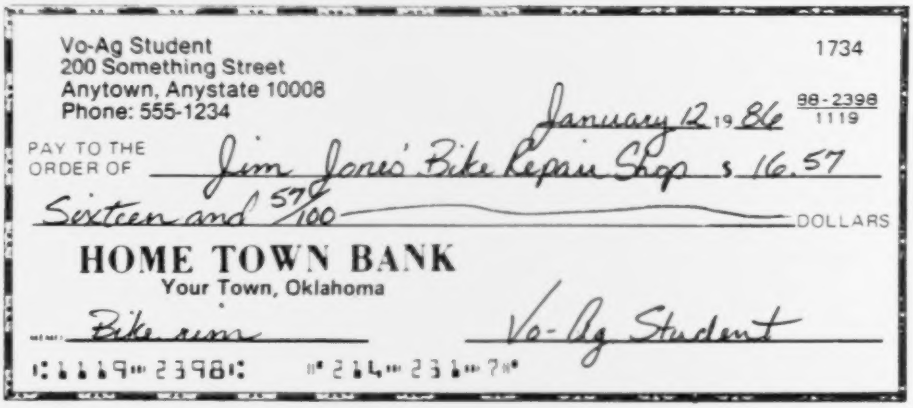
500# 18% hog ration

Vo-Ag Student

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

ANSWERS TO ASSIGNMENT SHEETS

D.



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1734

January 12 19 86

88-2398
1119

PAY TO THE ORDER OF Jim Jones' Bike Repair Shop $ 16.57

Sixteen and 57/100 DOLLARS

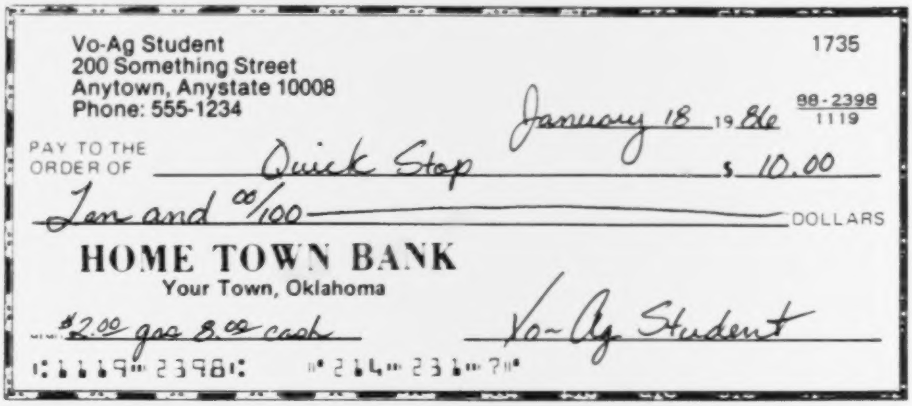
HOME TOWN BANK
Your Town, Oklahoma

Bike rim

Vo-Ag Student

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

E.



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1735

January 18 19 86

88-2398
1119

PAY TO THE ORDER OF Quick Stop $ 10.00

Ten and 00/100 DOLLARS

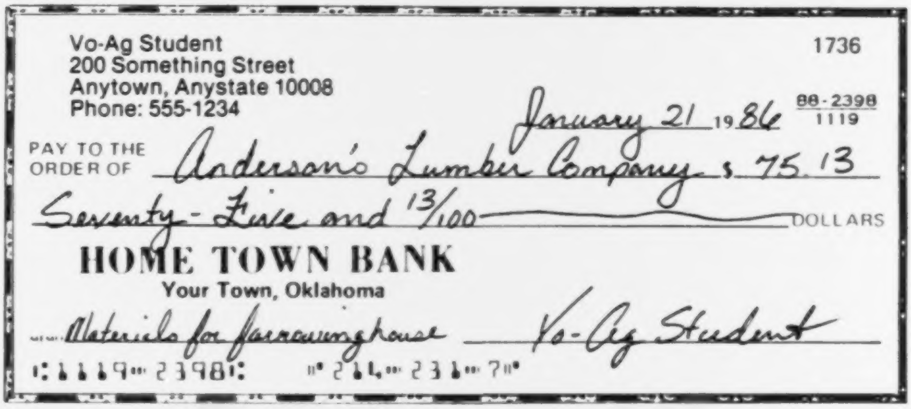
HOME TOWN BANK
Your Town, Oklahoma

$2.00 gas 8.00 cash

Vo-Ag Student

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

F.



Vo-Ag Student
200 Something Street
Anytown, Anystate 10008
Phone: 555-1234

1736

January 21 19 86

88-2398
1119

PAY TO THE ORDER OF Anderson's Lumber Company $ 75.13

Seventy-Five and 13/100 DOLLARS

HOME TOWN BANK
Your Town, Oklahoma

Materials for farrowing house

Vo-Ag Student

⑆1119⑈2398⑆ ⑈214⑈231⑈7⑈

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #3

PART II

A.

CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student

Student's Address

DATE January 6 1986

CASH	CURRENCY	5	00
	COIN	1	35
LIST CHECKS SINGLY	Smiths Wages	100	00
TOTAL FROM OTHER SIDE		~	
TOTAL		106	35
LESS CASH RECEIVED		~	
NET DEPOSIT		106	35

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

B.

CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student

Student's Address

DATE January 20, 1986

Student's initial

CASH	CURRENCY		
	COIN		
LIST CHECKS SINGLY	Smith's Wages	100	00
TOTAL FROM OTHER SIDE		~	
TOTAL		100	00
LESS CASH RECEIVED		25	00
NET DEPOSIT		75	00

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

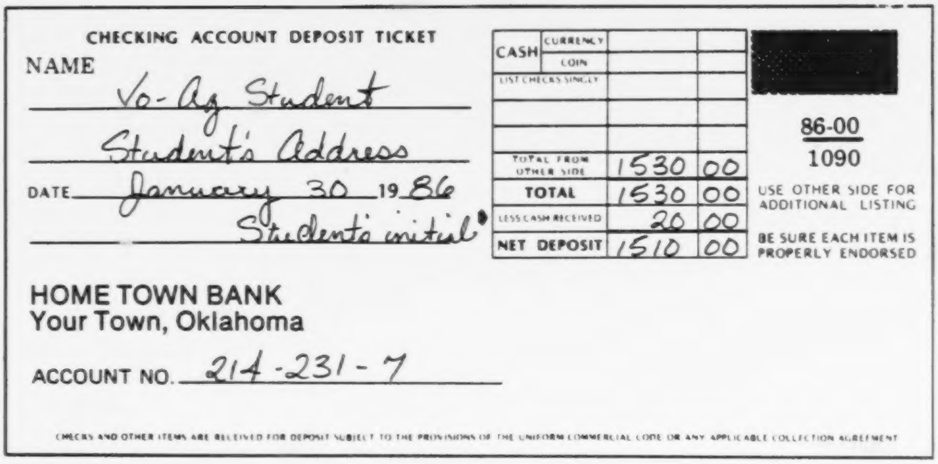
CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

C.

CHECKS LIST SINGLY	DOLLARS	CENTS
1 Burns - 2 pigs	110	00
2 Fisher - 1 reg. gilt	100	00
3 LongFellow - 21 pigs	1050	00
4 Brown - 1 reg. gilt	125	00
5 Aunt Kathy - gift	10	00
6 Foster - Shotgun	135	00
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
TOTAL	1530	00

ENTER TOTAL ON THE FRONT OT THIS TICKET

ANSWERS TO ASSIGNMENT SHEETS



CHECKING ACCOUNT DEPOSIT TICKET

NAME Vo-Ag Student

Student's Address

DATE January 30 19 86

Student's initial

CASH	CURRENCY		
	COIN		
LIST CHECKS SINGLY			
TOTAL FROM OTHER SIDE		1530	00
TOTAL		1530	00
LESS CASH RECEIVED		20	00
NET DEPOSIT		1510	00

[redacted]

86-00
1090

USE OTHER SIDE FOR ADDITIONAL LISTING

BE SURE EACH ITEM IS PROPERLY ENDORSED

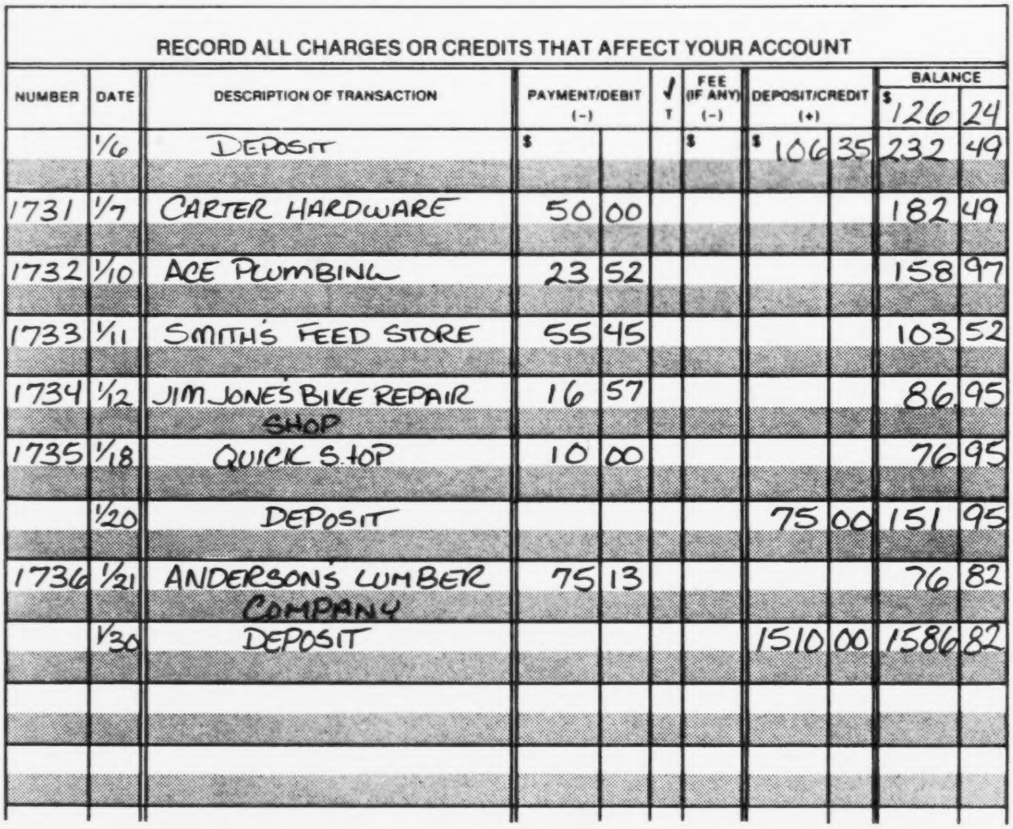
HOME TOWN BANK
Your Town, Oklahoma

ACCOUNT NO. 214-231-7

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

Assignment Sheet #4

PART II



RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT

NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (−)		✓ T	FEE (IF ANY) (−)	DEPOSIT/CREDIT (+)		BALANCE	
									$ 126	24
	1/6	DEPOSIT	$			$	$ 106	35	232	49
1731	1/7	CARTER HARDWARE	50	00					182	49
1732	1/10	ACE PLUMBING	23	52					158	97
1733	1/11	SMITH'S FEED STORE	55	45					103	52
1734	1/12	JIM JONES BIKE REPAIR SHOP	16	57					86	95
1735	1/18	QUICK STOP	10	00					76	95
	1/20	DEPOSIT					75	00	151	95
1736	1/21	ANDERSON'S LUMBER COMPANY	75	13					76	82
	1/30	DEPOSIT					1510	00	1586	82

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #5

PART I

June 30, 19 86

CHECKS OUTSTANDING
(Written but not shown on statement)

Check Number	Amount	
69	3	87
71	15	95
74	7	68
75	4	26
Total	31	76

THIS FORM WILL HELP YOU BALANCE YOUR CHECKING-ACCOUNT STATEMENT

CHECKING-ACCOUNT BALANCE *(Shown on this statement)* $ 512.36

ADD + DEPOSITS MADE *(But not shown on this statement)* $ 00.00

TOTAL $ 512.36

SUBTRACT – CHECKS OUTSTANDING $ 31.76

BALANCE *(Should agree with check register after subtracting any charges shown on this statement)* $ 480.60

PART II

Jan. 28, 19 86

CHECKS OUTSTANDING
(Written but not shown on statement)

Check Number	Amount	
1734	16	57
1735	10	00
Total	26	57

THIS FORM WILL HELP YOU BALANCE YOUR CHECKING-ACCOUNT STATEMENT

CHECKING-ACCOUNT BALANCE *(Shown on this statement)* $ 98.57

ADD + DEPOSITS MADE *(But not shown on this statement)* $ 1510.00

TOTAL $ 1608.57

SUBTRACT – CHECKS OUTSTANDING $ 26.57

BALANCE *(Should agree with check register after subtracting any charges shown on this statement)* $ 1582.00

HANDLE FINANCES
UNIT I

TEST

NAME ____ SCORE ________________

1. Match to their correct definitions terms associated with handling finances. Write the correct numbers in the blanks. Terms and definitions continue on next page.

______a. Amount of money checking- or savings-account holder has in financial institution

______b. Account against which depositor may write checks

______c. Check that has been paid by financial institution

______d. Money placed in an account

______e. Person who places money in an account

______f. To sign your name on back of check written to you

______g. Check that has not reached and been recorded by financial institution and does not appear on checking-account statement

______h. Deposit that has not reached and been recorded by financial institution and does not appear on checking-account statement

______i. Check written when there is no money, or not enough money, in checking account

______j. Person or business to receive payment; also person or business to whom you write a check

______k. To make balance in check register agree with balance on checking-account statement

______l. Fee financial institution charges for its services

______m. Customer's instructions to financial institution requesting that institution not pay a check

______n. Systematic method of planning for spending based on expected income

______o. Objective a person is willing to work toward achieving

1. Service charge
2. Goal
3. Stop payment
4. Reconcile
5. Overdraft
6. Outstanding check
7. Depositor
8. Cancelled check
9. Balance
10. Money management
11. Payee
12. Outstanding deposit
13. Endorse
14. Deposit
15. Checking account

TEST

______p. Plan for the use of money based on goals and expected income and expenses

______q. Share of profit paid to shareholders or stockholders in proportion to share of ownership

______r. Price paid for the use of money over a period of time

______s. Anyone who uses goods and services

______t. Your name written in ink at left end on back of check

______u. Establishment for the custody, loan, exchange, or issue of money; for the extension of credit; and for ease in sending funds

16. Endorsement
17. Budget
18. Dividend
19. Financial institution
20. Consumer
21. Interest

2. State benefits of money management.

a. ____

b. ____

c. ____

3. Select from the following list guidelines that promote effective money management. Write an "X" in the blank before each correct answer.

______a. Review money-management decisions and achievement of goals

______b. Pay bills with cash

______c. Be aware of factors that influence consumer spending

______d. Set personal goals

______e. Keep large amounts of money in the checking account

______f. Use a budget

4. List five factors that influence consumer spending.

a. ____

b. ____

c. ____

d. ____

e. ____

TEST

5. Select from the following list functions of financial institutions. Write an "X" in the blank before each correct answer.

______a. Make loans to businesses and individuals

______b. Receive deposits

______c. Prevent you from overdrawing your account

______d. Provide checking and savings accounts

______e. Assist in applying for a driver's license

______f. Transfer money from one account to another

______g. Provide helpful services

______h. Make sure that customers get paychecks

6. Match types of financial institutions to their correct descriptions. Write the correct numbers in the blanks.

______a. Financial institution owned and operated by its stockholders for profits; often called *full-service bank* because it offers a variety of services

______b. Nonprofit financial institution owned by shareholders who receive dividends on savings; may offer higher interest rates for savings accounts and time deposits than commercial banks may offer

______c. Nonprofit financial institution owned and operated by its members to save and borrow money; usually offers higher interest rates on savings than commercial banks and savings and loan associations

______d. Financial institution specializing in savings accounts and owned by its depositors; usually the earnings paid on savings are a little higher than those paid at commercial banks; but if the financial institution earns no profit, the depositors receive little or no interest on their savings

1. Credit union
2. Commercial bank
3. Mutual savings bank
4. Savings and loan association

7. State reasons for saving money.

a. ____

b. ____

c. ____

TEST

d. ____

e. ____

f. ____

g. ____

8. Select from the following list guidelines for saving money. Write an "X" in the blank before each correct answer.

_____a. Save a realistic amount regularly

_____b. Carry enough cash for impulse buying

_____c. Start now

_____d. Keep savings goal(s) in mind

_____e. Put into savings money to pay current expenses and unpaid bills

_____f. Make savings deposits soon after pay is received

_____g. Select a savings account that meets personal needs

9. Match types of saving methods to their correct definitions. Write the correct numbers in the blanks.

_____a. Account that allows deposits and withdrawals to be made in varying amounts

_____b. Money deposited for a set period of time; earns a set annual rate of interest

_____c. Type of life-insurance policy that offers savings features in addition to the protection afforded the policyholder

_____d. Type of protection purchased from insurance company for the purpose of providing income for the policyholder until death

_____e. Specific plan involving savings features for a worker

_____f. Savings plan that helps people establish financial security for the time when they are no longer working

_____g. Financial instrument that earns interest over a period of time

1. Employee savings plan
2. Endowment insurance
3. Savings account
4. Retirement account
5. Annuity
6. Certificate of deposit
7. Certificate

TEST

10. Match types of financial instruments to their correct descriptions. Write the correct numbers in the blanks.

______a. Written form used to withdraw money from a checking account

______b. Ordinary personal check drawn by a depositor on which the financial institution stamps or writes a certification that guarantees its payment

______c. Written form a person buys to send money to another person

______d. Special form of check that is signed by the buyer at time of purchase

______e. Portion of checkbook designed for recording checks written, deposits made, and service fees charged; and for calculating checking-account balance

______f. Written form for placing money in a checking or savings account

______g. Monthly report provided by financial institution of deposits, checks, service charges, and balances

1. Checking-account statement
2. Money order
3. Check
4. Deposit slip
5. Certified check
6. Check register
7. Traveler's check

11. Select from the following list advantages of a checking account. Write an "X" in the blank before each correct answer.

______a. Protects money from loss or theft

______b. Authorizes arrest for overdraft

______c. Provides service charges

______d. Provides a convenient way to pay bills

______e. Charges extra for overdraft

______f. Is usually accepted as proof of payment by law

______g. Provides a record of money spent

12. Name types of checking accounts.

a. ______________________________

b. ______________________________

c. ______________________________

TEST

13. Arrange in order steps to take when opening a checking account. Write a "1" in the blank before the first step, a "2" in the blank before the second step, and so on.

______a. Get a few blank checks to use until your checks are printed

______b. Give completed form to person opening your account

______c. Sign your name on signature card as it will be written on your checks

______d. Order checks printed with your name and address

______e. Fill out checking account deposit slip

______f. Fill out signature card, giving personal information

14. Match types of check endorsements to their correct descriptions. Write the correct numbers in the blanks.

______a. Gives special directions such as *For deposit only* on back left-hand end of check

______b. Payee signs name on back left-hand end of check

______c. Payee writes *Pay to the order of* on back left-hand end of check

1. Special endorsement
2. Blank endorsement
3. Restricted endorsement

15. State ways to request stop payment on a check.

a. ____

b. ____

16. Select from the following list points to remember when writing checks. Write an "X" in the blank before each correct answer.

______a. Write checks in No. 2 lead pencil

______b. Never sign a blank check

______c. Write amount in words as far to left as possible in space given; fill in unused portion with wavy line

______d. Scratch out mistake and write in correction above it

______e. Place decimal correctly

______f. Leave memo line at bottom left of check blank

______g. Fill in all blanks

______h. Write in ink

______i. Do not cross out or erase on the check

TEST

_____j. Sign all checks as soon as the bank sends them to you

_____k. Write amount close to dollar sign so that it cannot be changed

_____l. Write clearly

_____m. Use correct date

17. Select from the following list points to remember when writing deposit slips. Write an "X" in the blank before each correct answer.

_____a. Endorse all checks listed

_____b. Write your age on deposit slip

_____c. Endorse back of deposit slip

_____d. Write name and account number on deposit slip

_____e. Get copy of deposit slip with bank stamp on it

_____f. Do not enter deposit in your check register

_____g. Sign deposit slip to receive cash

_____h. Write date on deposit slip

18. Select from the following list reasons for keeping a check register. Write an "X" in the blank before each correct answer.

_____a. Gives record to compare with checking-account statement

_____b. Provides reason for buying a calculator

_____c. Keeps record of deposits made

_____d. Helps avoid overdrafts

_____e. Shows dates of checks and deposits

_____f. Makes a good diary

_____g. Shows balance at all times

_____h. Keeps record of checks written

19. State reasons for reconciling a checking-account statement.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

TEST

20. Arrange in order steps for reconciling a checking-account statement. Write a "1" in the blank before the first step, a "2" in the blank before the second step, and so on.

______a. Circle check-register total to show that you agree with financial institution

______b. Check ( ) all cancelled checks and deposits in check register

______c. Subtract service charge from check register

______d. List and add total outstanding checks (those not returned to bank or checked in your register)

______e. Add total outstanding deposits to balance shown on statement

______f. Make sure that adjusted checking-account balance and adjusted check-register balance are equal

______g. Arrange cancelled check numerically

______h. Subtract total outstanding checks from total of checking-account balance and outstanding deposits

______i. Add and record total outstanding deposits

______j. Compare amounts of cancelled checks and deposits in checking-account statement with amounts written in check register

(NOTE: Test items 21 through 25 list the assignment sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

21. Develop a savings plan.

22. Write checks.

23. Write deposit slips.

24. Complete a check register.

25. Reconcile a checking-account statement.

HANDLE FINANCES
UNIT I

ANSWERS TO TEST

1. a. 9
   b. 15
   c. 8
   d. 14
   e. 7
   f. 13
   g. 6
   h. 12
   i. 5
   j. 11
   k. 4
   l. 1
   m. 3
   n. 10
   o. 2
   p. 17
   q. 18
   r. 21
   s. 20
   t. 16
   u. 19

2. a. Helps you use your income efficiently
   b. Helps you appreciate value of money you earn
   c. Helps you achieve short-term and long-range goals

3. a, c, d, f

4. Answer should include any five of the following

   a. Income
   b. Lifestyle
   c. Advertising
   d. Availability of goods and services
   e. Influence of others
   f. Basic needs and wants
   g. Prices
   h. Fashion
   i. Mood

5. a, b, d, f, g

6. a. 2
   b. 4
   c. 1
   d. 3

7. a. Emergencies (unforeseen needs)
   b. Expensive purchases
   c. Large recurring expenses
   d. Retirement
   e. College
   f. Vacations
   g. Investments

8. a, c, d, f, g

ANSWERS TO TEST

9. a. 3
   b. 6
   c. 2
   d. 5
   e. 1
   f. 4
   g. 7

10. a. 3
    b. 5
    c. 2
    d. 7
    e. 6
    f. 4
    g. 1

11. a, d, f, g

12. a. Regular checking
    b. Interest-on-checking
    c. Commercial checking

13. a. 6
    b. 4
    c. 2
    d. 5
    e. 3
    f. 1

14. a. 3
    b. 2
    c. 1

15. a. In writing
    b. By phone

16. b, c, e, g, h, i, k, l, m

17. a, d, e, g, h

18. a, c, d, e, g, h

19. a. A check you have written may not have arrived yet at the financial institution
    b. A deposit may have been made after your statement was mailed
    c. You may have made an error in arithmetic in your check register
    d. Financial institution may have made an error

ANSWERS TO TEST

20.
- a. 10
- b. 4
- c. 1
- d. 5
- e. 7
- f. 9
- g. 2
- h. 8
- i. 6
- j. 3

21. Evaluated to the satisfaction of the instructor

22. Evaluated to the satisfaction of the instructor

23. Evaluated to the satisfaction of the instructor

24. Evaluated to the satisfaction of the instructor

25. Evaluated to the satisfaction of the instructor

OBTAIN AND USE CREDIT
UNIT II

UNIT OBJECTIVE

After completing this unit, the student should be able to determine personal credit standing, evaluate credit and loan situations, compare financing methods, determine when to borrow money, and complete applications for credit and an agricultural loan. The student will show this ability by completing the assignment sheets and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with obtaining and using credit.
2. Discuss advantages and disadvantages of using credit.
3. Match types of credit to their correct definitions.
4. Select from a list guidelines for building and maintaining a good credit standing.
5. List the three Cs of good credit.
6. State factors that a lender looks for in a borrower.
7. Select from a list factors that a borrower looks for in a lender.
8. State indicators of good loan-repayment ability.
9. State indicators of poor loan-repayment ability.
10. Match to their correct definitions major types of credit extended by businesses.
11. Match to their correct descriptions types of loans issued by banks and other lending institutions.
12. List sources of farm credit.
13. State factors that determine the cost of credit.
14. Match methods of computing interest to their correct definitions.
15. Write the formula for calculating the true annual interest rate.
16. Match types of credit instruments to their correct descriptions.

OBJECTIVE SHEET

17. Determine personal credit standing.
18. Evaluate credit and loan situations.
19. Calculate interest expense.
20. Compare financing methods.
21. Determine when to borrow.
22. Complete an application for credit.
23. Complete an application for an agricultural loan.

OBTAIN AND USE CREDIT
UNIT II

SUGGESTED ACTIVITIES

I. Unit contents

- A. Objective sheet
- B. Suggested activities
    1. Supplements
        - a. Supplement #1 — Where Do We Get Money?
        - b. Supplement #2 — Where Does Your Money Go?
        - c. Supplement #3 — Different Kinds of Investments
        - d. Supplement #4 — Discussion Questions for *Credit: A Capital Idea*
        - e. Supplement #5 — What Is Credit?
        - f. Supplement #6 — Glossary of Credit Terms
        - g. Supplement #7 — Credit-Terms Crossword Puzzle
        - h. Supplement #8 — Sources of Farm Credit
        - i. Supplement #9 — Introduction to Farm-Credit Borrowing Process
        - j. Supplement #10 — Consider Credit Responsibilities
    2. Transparency masters
        - a. TM #1 — Credit Instruments
        - b. TM #2 — Credit Instruments (Continued)
        - c. TM #3 — Credit Instruments (Continued)
- C. Information sheet
- D. Assignment sheets
    1. Assignment Sheet #1 — Determine Personal Credit Standing
    2. Assignment Sheet #2 — Evaluate Credit and Loan Situations
    3. Assignment Sheet #3 — Calculate Interest Expense

SUGGESTED ACTIVITIES

4. Assignment Sheet #4 — Compare Financing Methods
5. Assignment Sheet #5 — Determine When to Borrow
6. Assignment Sheet #6 — Complete an Application for Credit
7. Assignment Sheet #7 — Complete an Application for an Agricultural Loan

E. Answers to assignment sheets

F. Test

G. Answers to test

II. Instructor's guide

A. Review unit and plan presentation.

B. Obtain materials to supplement unit.

1. Study manual, "Financing Modern Agriculture"

(NOTE: Order one copy for each student in class. Available from Farm Credit Banks of Wichita, 151 North Main, Wichita, Kansas 67202.)

2. Films

a. *Credit: A Capital Idea* — (18 minutes—color)—In this fully animated film, a modern farmer is transformed into a delightful cartoon character—a big-game hunter who goes on safari through the financial jungle in search of the elusive quarry of profits. While the film is primarily directed at the wise use of farm credit, the principles explained are applicable to borrowing in other businesses and to personal finances. The film contains tips on how to use credit profitably.

b. *The Rock and the Hard Place* — (23 minutes—color)—This film focuses on actual agricultural producers who, as skilled business people, express their feelings about breaking away from the old ways.

c. *Farmers Who Bank on Themselves* — (18 minutes—color)—This film is about the Farm Credit System. Through the eyes of farmers, the film explains how loan funds are used by farmers and farmer cooperatives and how the system is organized.

d. *Some Call It Luck* — (20 minutes—color)—A story of two young farmers and their differing approaches to the business end of their farming operations. Film points out that fiscal planning is a major factor in the success or failure of the farm business.

SUGGESTED ACTIVITIES

e. *Some Land of My Own* — (18 minutes—color)—This film explains and illustrates some of the things that a farmer should know and do when about to buy a farm. The film also points out the importance of loan terms and puts special emphasis on repayment ability.

(NOTE: All the films listed in this section are available on a free-loan basis from The Farm Credit Banks of Wichita, 151 North Main, Wichita, Kansas 67202. The films *Credit: A Capital Idea* and *Farmers Who Bank on Themselves* are available to Oklahoma teachers on a free-loan basis from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

3. Microcomputer software, *Loan*. This program computes either interest rate, payment amount, amount of loan, or years of loan when the other three variables and number of payments per year are entered. Payments, schedule of interest, principal, and balance owed are also printed. Available for TRS-80, Apple II compatibles, and MSDOS microcomputers from Oklahoma State University, Department of Agricultural Economics, 513 Ag. Hall, Stillwater, Oklahoma 74078.

4. Credit instruments available from local financial institutions

EXAMPLES: Check, draft, promissory note, mortgage, bill of sale, warehouse receipt, financing statement, loan application, credit application, security agreement, bill of lading, sales contract

5. Transparencies and competency profiles

(NOTE: Transparencies and competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Have available an overhead projector, and set up film projector if you have scheduled films or filmstrips.

D. Make copies of supplements if needed.

E. Provide students with unit.

F. Introduce unit.

(NOTE: The major thrusts of this unit are twofold: to increase student awareness of the wise use of credit and to have students complete a loan application.)

1. Use Supplements #1 and #2 to show where money comes from and how money is spent.

SUGGESTED ACTIVITIES

2. Use Supplement #3 to discuss the different kinds of investments a student might consider.

3. Show the film *Credit: A Capital Idea*. Have students complete Supplement #4, either during or after the film. Use the information in the film to support discussion of objectives during lesson.

G. Discuss information and assignment sheets.

1. Use Information Sheet, Section I to discuss terms associated with obtaining and using credit.

   SUGGESTIONS:

   - Point out the importance of defining terms for common understanding.
   - Use Supplement #5 in discussing credit. Point out that credit is a person's borrowing capacity, while debt is the amount of money a person has borrowed.
   - Use Supplement #6 to provide additional terms on credit.
   - Use Supplement #7 to review the terms and definitions in Section I.

2. Use Information Sheet, Section II to discuss advantages and disadvantages of using credit.

   SUGGESTIONS:

   - Emphasize that credit should be used as a management tool.
   - Have students cite examples of each advantage and disadvantage of using credit.

3. Use Information Sheet, Section III to distinguish between production credit and consumption credit.

   SUGGESTIONS:

   - Have students cite examples of items that would be purchased with production credit and items that would be purchased with consumption credit.
   - Show film *Some Call It Luck*. Point out the importance of fiscal planning.

4. Discuss guidelines for building and maintaining a good credit standing. Use Information Sheet, Section IV and Assignment Sheet #1. Specify how students are to complete the various parts of Assignment Sheet #1.

SUGGESTED ACTIVITIES

5. Use Information Sheet, Sections V, VI, and VII to discuss the three Cs of good credit and the characteristics of a good borrower and a good lender.

   SUGGESTIONS:

   - Arrange for a lender to speak to the class on what he or she looks for in a borrower.
   - Arrange for a farmer (one who uses credit in the farm business) to speak to the class on what he or she looks for in a lender.
   - Emphasize the importance of an agricultural lender who understands farming and ranching.

6. Have students emphasize which indicators of good loan-repayment ability they consider most important when discussing Information Sheet, Section VIII.

7. Use Information Sheet, Section IX to discuss indicators of poor loan-repayment ability.

   SUGGESTIONS:

   - Have students give you ten reasons for many borrowers having poor repayment ability.
   - Point out that a farmer's attitude toward risk, uncertainty, and debt (and the decisions that are made) is affected by where the farm business is in the life cycle. Stages of the farm-business life cycle include establishment, expansion, consolidation, and transfer.
   - Show film *Some Land of My Own*. The film points out the importance of loan terms and puts special emphasis on repayment ability.

8. Use Information Sheet, Section X to discuss the major types of credit extended by businesses.

   SUGGESTIONS:

   - Point out local businesses that might extend types of credit.

     EXAMPLES: Department stores, feed stores, fuel suppliers, furniture store

   - Have students survey the local community for businesses that extend credit to customers.

9. Discuss types of loans issued by banks and other lending institutions. Use Information Sheet, Section XI and Assignment Sheet #2.

SUGGESTED ACTIVITIES

10. Use Information Sheet, Section XII to discuss sources of farm credit.

    SUGGESTIONS:

    - Contact local lending institutions for current interest rates and terms.
    - Be very careful in discussing the various lending agencies (you do not want to be quoted negatively).
    - Have students survey their parents on what sources of credit they use.
    - Arrange for representatives from various sources of farm credit to form a lenders' panel. Ask each representative to discuss how their lending institution operates, and to discuss their lending policies and types of loans. Have an open discussion session between students and lenders. You should serve as moderator for the panel.

      EXAMPLES: Production Credit Association, Federal Land Bank Association, Farmers Home Administration, local banker(s), local real estate developer who specializes in farm sales, local farm-equipment dealer, farm-loan specialist from insurance company

    - Show film *Farmers Who Bank on Themselves*. The film points out how the Farm Credit System is organized and how it operates.
    - Have students complete Supplement #8. You may want to add items to the list.

11. Use Information Sheet, Section XIII to discuss factors that determine the cost of credit.

    SUGGESTIONS:

    - Emphasize that interest is only one of many costs of credit.
    - Point out why interest rates tend to fluctuate. Discuss terms such as *prime interest rate, base rate*, etc.

12. Discuss methods of computing interest and the true annual interest rate. Use Information Sheet, Sections XIV and XV and Assignment Sheets #3 through #5. Specify how and when the assignment sheets should be completed.

    SUGGESTIONS:

    - Point out why the quotable interest rate on a loan is a very unreliable figure in determining the true interest rate. Emphasize the importance of using the same formula for true interest rate when comparing loans.

SUGGESTED ACTIVITIES

(NOTE: Annual percentage rate [APR] is required on all loans. APR is very complex to compute and requires compound interest tables. True annual interest rate is a simplified form but is not as accurate as APR.)

- Show film *The Rock and the Hard Place*. The film shows farmers breaking away from the old ways of farm financing.
- You may wish to do Assignment Sheet #5 in class. Have students work the assignment together.
- Use microcomputer software program *Loan* to illustrate the use of a computer in calculating loan costs and in determining a repayment schedule.

13. Use Information Sheet, Section XVI to discuss credit instruments.

SUGGESTIONS:

- Point out the importance of using legal credit instruments.
- Have students survey their parents for examples of when they use various credit instruments.
- Obtain copies of various credit instruments from local lending institution to show students.
- Use Transparencies #1 through #3 to illustrate examples of common credit instruments.
- Use Supplement #9 to review credit and how it should be used.

14. Have students complete Assignment Sheets #6 and #7 to practice completing applications for credit and an agricultural loan.

SUGGESTIONS:

- Have students complete the application for credit, using information about themselves at the date of application.
- Point out to students that the application for an agricultural loan is for a typical farmer or FFA member and that their local lending institution may have different application forms.
- Use Supplement #10 to review the credit responsibilities of the borrower and the lender.
- Arrange for a tour of a local lending institution and an interview with a loan officer.

EXAMPLE: Bank, savings and loan association, PCA, Federal Land Bank Association, FmHA

SUGGESTED ACTIVITIES

H. Give test.

I. Critique test and discuss in class.

J. Reteach and retest if necessary.

K. Complete appropriate section of competency profiles.

III. Unit references

A. *Agricultural Economics Curriculum Workshop*. Ames, Iowa: Iowa State University/Iowa Vocational and Instructional Materials, 1981.

B. Braker, Pete. *Vocational Agriculture II*, rev. ed. Stillwater, Oklahoma: Oklahoma State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1975.

C. Crawford, Lucy C., and Richard L. Lynch. *Finance and Credit*. New York: McGraw-Hill Book Company, 1979.

D. *Financing Modern Agriculture*. Wichita, Kansas: Farm Credit Banks of Wichita, 1976.

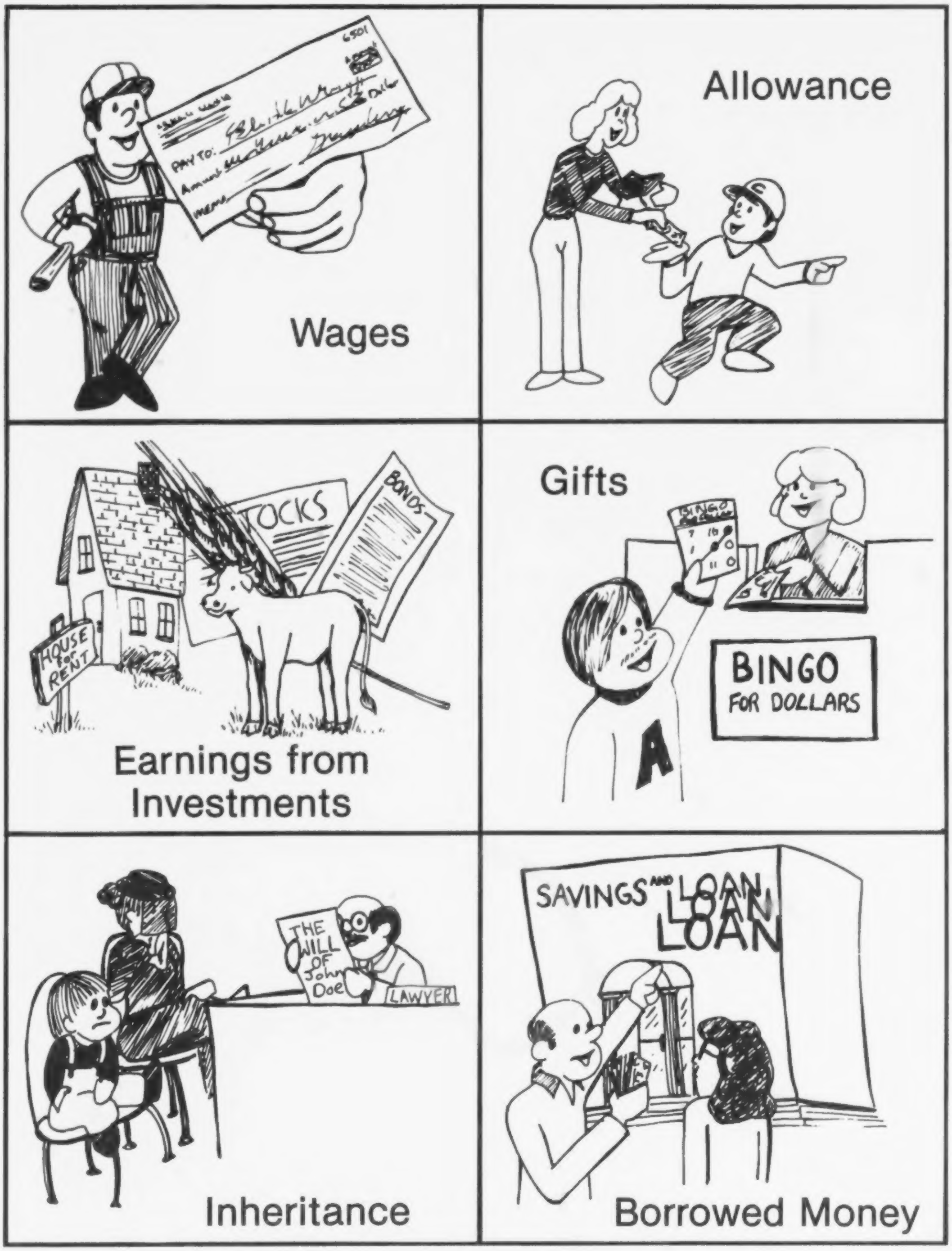
E. Morrow, Barbara A. *Managing Your Money*. St. Louis, Missouri: Milliken Publishing Co., 1980.

F. Nelson, Frank W. *Group Instruction for Cooperative Programs*. Stillwater, Oklahoma: Oklahoma State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1978.

G. Steward, Jim. *Farm Business Management, Volume I*, rev. ed. Stillwater, Oklahoma: Oklahoma State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1984.

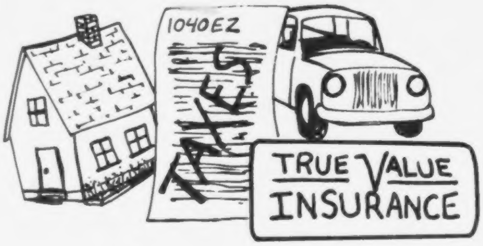
SUGGESTED ACTIVITIES

SUPPLEMENT #1 — WHERE DO WE GET MONEY?


Wages
PAY TO:
Amount
MEMO
6501
Allowance
Earnings from Investments
HOUSE FOR RENT
STOCKS
BONDS
Gifts
BINGO
BINGO FOR DOLLARS
A
Inheritance
THE WILL OF John Doe
LAWYER
Borrowed Money
SAVINGS AND LOAN
LOAN
LOAN

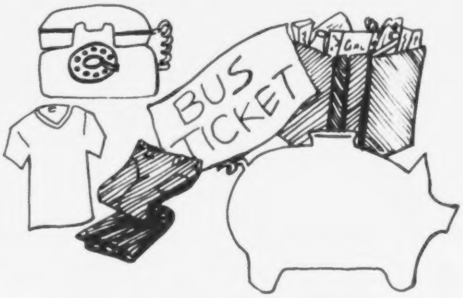
SUGGESTED ACTIVITIES

SUPPLEMENT #2 — WHERE DOES YOUR MONEY GO?


1040EZ
TAXES
TRUE VALUE
INSURANCE

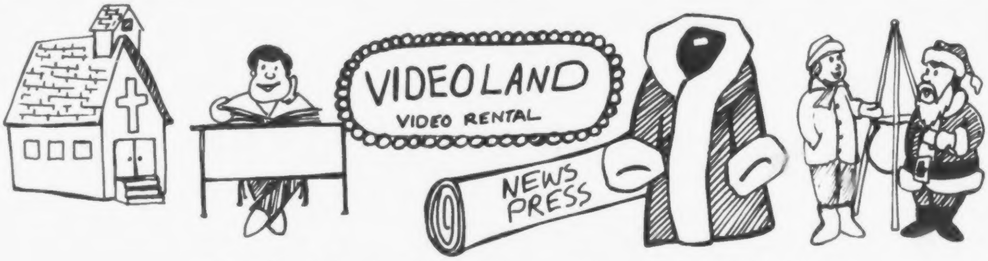
Fixed Expenses

- Rent
- Insurance
- Taxes
- Car Payments
- All Other Legal Obligations to Pay



Variable Expenses for Needs

- Savings
- Medical Care
- Food
- Transportation
- Clothing
- Utilities

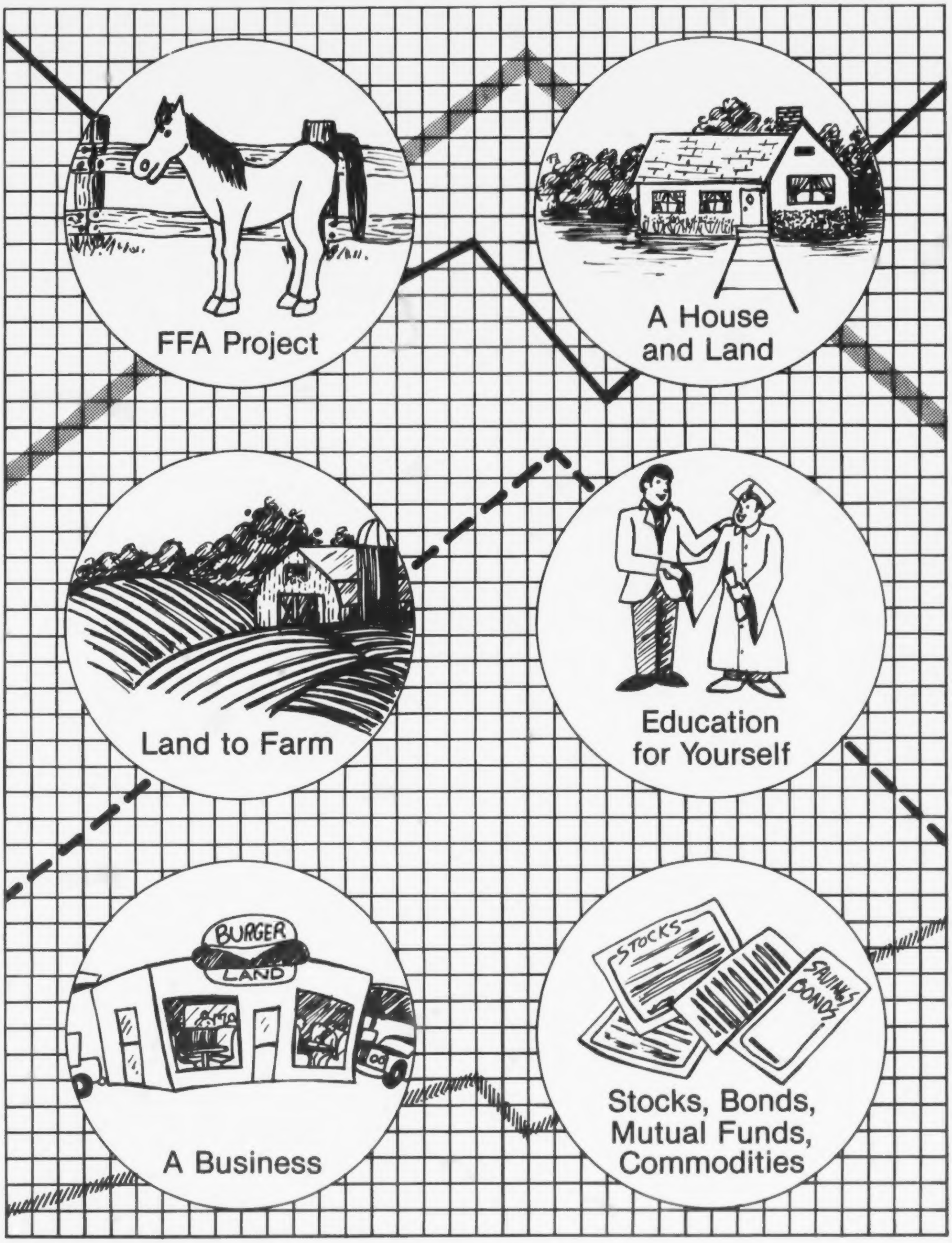

VIDEOLAND
VIDEO RENTAL
NEWS
PRESS

Variable Expenses for Wants

- Entertainment
- Contributions
- Education
- Periodicals
- Luxuries
- Personal Improvement

SUGGESTED ACTIVITIES

SUPPLEMENT #3 — DIFFERENT KINDS OF INVESTMENTS


FFA Project
A House and Land
Land to Farm
Education for Yourself
BURGER LAND
A Business
STOCKS
SAVINGS BONDS
Stocks, Bonds, Mutual Funds, Commodities

SUGGESTED ACTIVITIES

SUPPLEMENT #4 — DISCUSSION QUESTIONS FOR *CREDIT: A CAPITAL IDEA*

The purpose of this activity is to provide guidelines for viewing the film *Credit: A Capital Idea*. This sheet can be used to review or to stimulate discussion on farm credit.

1. The credit needs of farmers have (increased) (decreased) over the past ten years.
2. Loans available to farmers generally fall into three categories as far as length of time needed. These three categories are

Kind of credit	Typical length of use (years)
a. ______	
b. ______	
c. ______	

3. Why is it important to borrow money only for the period of time for which it is needed?

______

______

4. What are some different ways that interest charges are calculated?

______

______

5. What things should you look for when selecting a lender?

______

______

6. Why are good records important?

______

______

7. What should a good set of records include?

______

______

8. What things will make a lender say yes to a prospective borrower?

______

______

SUGGESTED ACTIVITIES

SUPPLEMENT #5 — WHAT IS CREDIT?

WHAT IS CREDIT?

.... A Friend in Need?

.... A Disgrace?

.... A Two-Edged Sword?

.... A Valuable Tool?

.... Bait for Bankruptcy?

VO AG II - 127-B

SUGGESTED ACTIVITIES

SUPPLEMENT #6 — GLOSSARY OF CREDIT TERMS

Bankruptcy proceeding — Legal form of settling all obligations, secured or otherwise, by turning over all except the exempt assets to creditors for distribution as decided by a legally appointed referee

Capital — Money invested in assets of a business

Chattels — Assets of a personal nature

EXAMPLES: Automobiles, machinery, livestock

Consumer — Anyone who uses goods and services

Co-sign — Process by which a person with another or others signs a negotiable instrument on its face and thereby becomes primarily liable for its payment

(NOTE: A co-signature is sometimes call a *co-maker*.)

Credit instrument — Document on which the obligation of the debtor and the right of the creditor are written

EXAMPLES: Promissory note, checks

Debts — Obligation due others, usually money owed

Deed — Instrument conveying real property

EXAMPLE: Land

Default — Failure to perform a duty or obligation; failure of a person to pay money when due or when lawfully demanded

Delinquent — Failing or neglecting to do what the loan contract requires

EXAMPLE: Payments on note not made as set up

Farm Credit Administration (FCA) — An independent agency of Executive Branch of federal government, which supervises and services cooperative agricultural lending institutions

(NOTE: Institutions served include Federal Land Banks and Federal Land Bank Associations, Federal Intermediate Credit Banks and Production Credit Associations, and Banks for Cooperatives. The operating costs of the FCA is borne by the farm credit banks.)

Farm Credit System — System consisting of the cooperative lending institutions supervised by the FCA; serves all fifty states and Puerto Rico

SUPPLEMENT #6

Federal Reserve System — Central banking system of the United States, created by an act of Congress

(NOTE: The Federal Reserve Act was passed in 1913. The Federal Reserve System consists of regional bankers' banks and all national and state member banks. There are twelve federal reserve banks and their branches. A board of governors located in Washington, D.C., exercises control of the system.)

Finance — To provide capital for the operation of the farm business

Financial institution — An establishment for the custody, loan, exchange, or issue of money; for extension of credit; and for ease in sending funds

EXAMPLES: Banks, credit unions, savings and loan associations, finance companies, production credit associations, federal land banks, mortgage companies

Float — Use of money during a delay between transaction and debit

Interest — Premium paid for the use of money

Lien — Legal claim upon the property of another; security for payment of a just debt

Loan — Business contract wherein one party, known as a *lender*, agrees to "rent" funds to a second party, known as a *borrower*

(NOTE: The borrower's obligation to return the funds is represented by a promissory note or some similar debt certificate. The funds may be "rented" with or without a fee. Loans may be demand or time loans, depending upon the agreement as to maturity. They may also be secured or unsecured.)

Maker — Person who makes or executes an instrument; a signer of an instrument

Maturity — Date on which a loan or note is due

National bank — Bank that is a member of the Federal Reserve System and chartered by the federal government

Operating credit — Line of credit advanced to pay operating expenses

Overdraft — Withdrawal from a financial institution by a depositor of money in excess of the balance on deposit in the account

Refinance — Repay one debt by borrowing from the same or another source

Renewal — Loan that has exceeded its maturity and has been set up again for another term

Service fee — Fee charged for services rendered

State bank — Bank chartered by a state

SUGGESTED ACTIVITIES

SUPPLEMENT #7 — CREDIT-TERMS CROSSWORD PUZZLE

Use the clues below to complete the crossword puzzle on the following page.

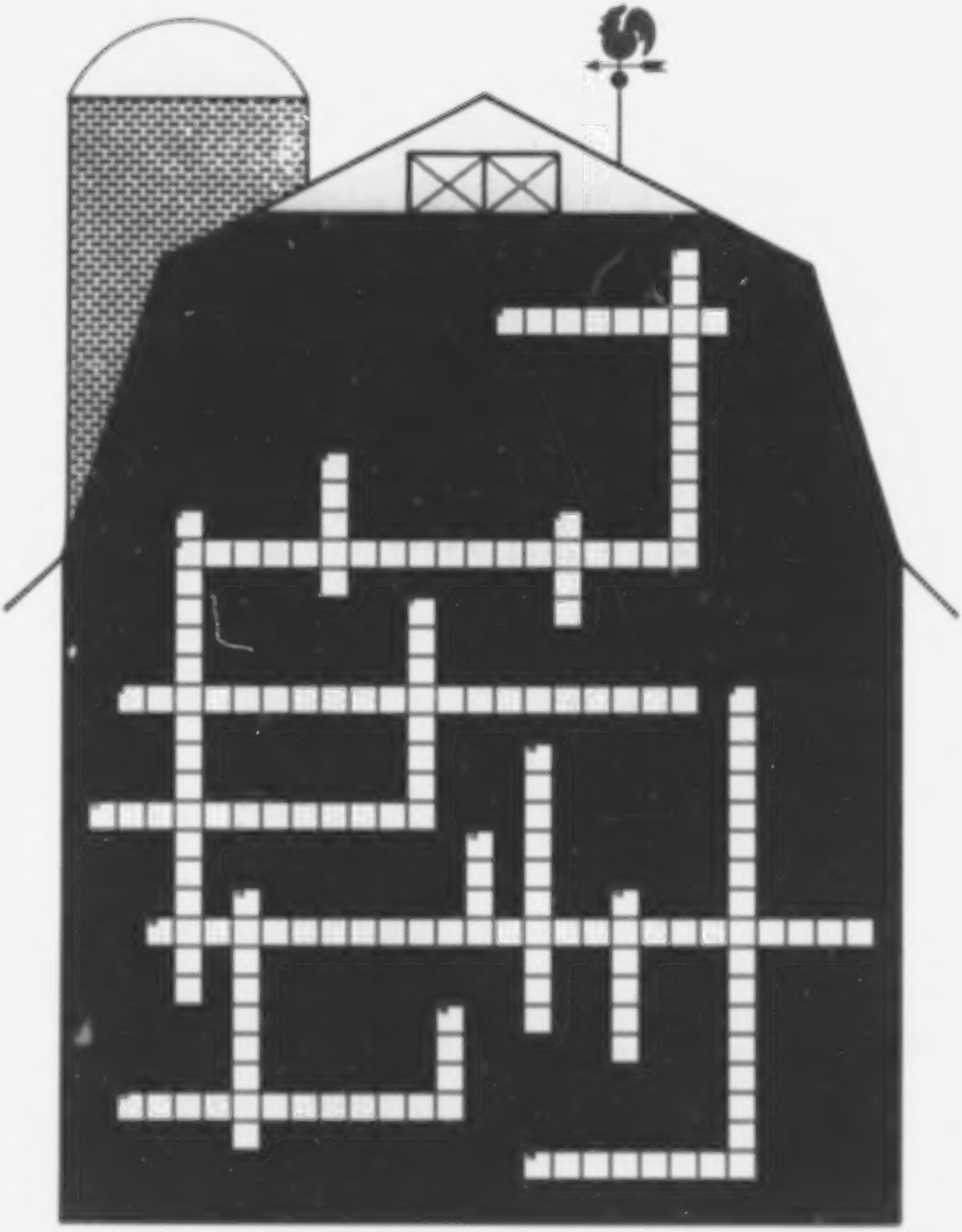
Down

1. Occurrence that cannot be assigned accurate odds on chances of its happening
3. With 7, 12, and 16 down, loans that provide same rate of interest over the life of the loan
4. Rate being charged by lender to best credit risk for short-term loans (3 wds.)
5. Unfavorable occurrence that can be assigned reasonably accurate odds on chances of its happening
7. See 3 down
9. Use of borrowed funds to supplement equity capital (2 wds.)
10. Items pledged or mortgaged to secure a note
12. See 3 down
13. Farm business's capacity to generate sufficient cash to meet its financial obligations as they fall due
14. Capacity to borrow money
16. See 3 down

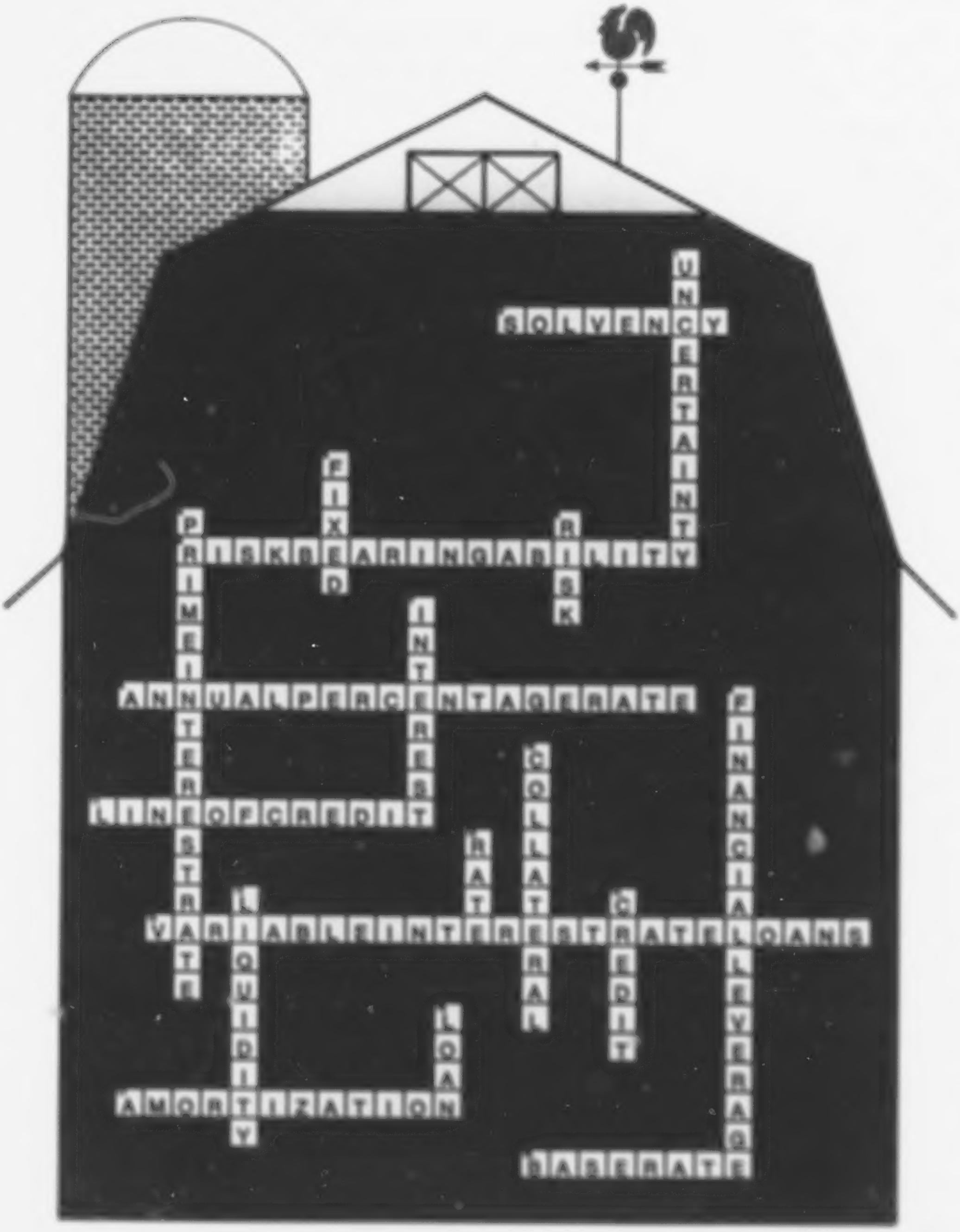
Across

2. Farm business's ability to meet long-run claims against the business
6. Farm business's ability to compensate for variations in expenses and income as well as judgment errors in use of credit (3 wds.)
8. Total finance charge on a loan, based upon compound interest table and expressed as an annual interest rate (3 wds.)
11. Financial arrangement that provides funds to cover operating and capital expenses during a complete farming cycle, normally one year (3 wds.)
15. Loans that provide a means by which interest rates may be lowered or raised, depending upon the cost of money in the markets (4 wds.)
17. Repayment of a loan with a regular series of payments over a specified period of time
18. Interest rate charged by lender that covers cost of money plus a reasonable profit (2 wds.)

SUPPLEMENT #7



SOLUTION TO SUPPLEMENT #7


UNCERTAINTY
SOLVENCY
FIXED
RISK
RISKBEARINGABILITY
PRIMEINTERESTRATE
INTEREST
ANNUALPERCENTAGERATE
FINANCIALLEVERAGE
COLLATERAL
LINEOFCREDIT
RATE
CREDIT
LIQUIDITY
VARIABLEINTERESTRATELOANS
LOAN
AMORTIZATION
BASERATE

SUGGESTED ACTIVITIES

SUPPLEMENT #8 — SOURCES OF FARM CREDIT

The purpose of this activity is to identify possible sources of credit for various farm items.

Indicate with an "X" the most likely sources of credit for each of the following items.

ITEM	Comm. Bank	Indi-vidual	Dealer	Fed. Land Bank	PCA	FmHA	CCC	Insur-ance Co.	Finance Co.
New tractor									
Seed									
Fuel									
160 acres									
Tractor repair									
New machine shed									
Fertilizer									
Hired labor									
Used 2-ton truck									
New water well									
25 bred sows									
Herbicide									
Purebred bull									
Cattle feed									
1000 feeder calves									
Margin money for futures contract									
New tractor tires									
1000 small trees for planting windbreak									
10 dairy cows									
New auto for son's graduation									
Family vacation to Disneyland									

ANSWERS TO SUPPLEMENT #8

ITEM	Comm. Bank	Indi-vidual	Dealer	Fed. Land Bank	PCA	FmHA	CCC	Insur-ance Co.	Finance Co.
New tractor	X	X	X		X	X			
Seed	X	X			X	X			
Fuel	X	X			X	X			
160 acres		X		X		X		X	
Tractor repair	X	X			X	X			
New machine shed	X	X		X		X		X	
Fertilizer	X	X			X	X			
Hired labor	X	X			X	X			
Used 2-ton truck	X	X	X		X	X			
New water well	X	X			X	X			
25 bred sows	X	X			X	X			
Herbicide	X	X			X	X			
Purebred bull	X	X			X	X			
Cattle feed	X	X			X	X			
1000 feeder calves	X	X			X	X			
Margin money for futures contract	X	X			X	X	X		
New tractor tires	X	X			X	X			
1000 small trees for planting windbreak	X	X			X	X			
10 dairy cows	X	X			X	X			
New auto for son's graduation	X	X	X						X
Family vacation to Disneyland	X	X							X

(NOTE: There may be exceptions to the answers listed above. Adapt the answer sheet to represent sources of credit for your area.)

SUGGESTED ACTIVITIES

SUPPLEMENT #9 — INTRODUCTION TO FARM-CREDIT BORROWING PROCESS

The purpose of this activity is to show the correct steps in the borrowing process. Read the material carefully, select the alternative of your choice, and advance to the number listed.

1. You secure a loan to put in this year's crop. You find your old tractor is no longer functional and will need to be replaced before field work begins. You decide to purchase a new tractor so you

   a. use the production loan to get a new tractor. (Go to #9.)

   b. go to the bank and secure a loan for a new tractor. (Go to #19.)

2. Sorry, but often a relative is not the best person from whom to secure a loan. Also, you do not know when the loan might be called back or how much management advice you would appreciate from Sam. (Take a look at #10 again.)

3. Wrong—while there *seems* to be a profit in this enterprise, this is an area where you have no experience. (Go back to question #14.)

4. Great! Operating expenses should be paid back with proceeds of the crops or livestock the money was used for. Livestock equipment will generally last several years so it is possible to spread out the payments over the life of the equipment. Make sure that loans on such items are paid off before the useful life of the equipment is over. Now that you have obtained your loan, you are looking forward to the first payment. An unexpected expense causes you to be short of making that payment. In another two weeks you will have some pigs to sell to cover the payment. You have two choices. Either you can wait until you sell the pigs and go in with the total amount, or you can talk to the banker, tell her or him your situation, and advise that payment will come soon. You decide to

   a. talk to banker about payment problems. (Go to #8.)

   b. not bother banker and pay it in two weeks. (Go to #21.)

5. Good. Having adequate insurance for added risks is very important. Many lenders require some type of insurance as a partial protection against your debt. Life insurance is one of the least expensive ways to protect a family with a large debt. The future of your family and farming operation is worth the small expense of adequate insurance. Borrowing money does involve some risk for both the borrower and lender. The lender may lose the amount of the loan made, but the borrower could lose his or her entire savings if sound and wise use of credit is not followed. When you begin to borrow, remember the following steps:

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SUPPLEMENT #9

- farm production loans should be used only for purposes that will increase your income;
- limit borrowing for enterprises that you do not fully understand;
- keep your debts as low as you can without reducing efficiency;
- study price trends and be governed by your judgment regarding them;
- keep debts in line with your net worth;
- keep debts in line with your probable income;
- select a dependable lender who will give the best terms;
- have a definite repayment program;
- be businesslike, fair, and frank with your lender;
- have adequate insurance for added risk.

6. Although the bigger tractor would be nice, there is little reason to put out the extra money for it at this time. If you could find more land, it might make it more practical. Try another number. (Go back to #18.)

7. Sorry, but you missed the point. Recreation is important, but a production loan should be used for a certain purpose. (Reread #19.)

8. Excellent choice. It is very important to be businesslike, fair, and frank with your lender. Of course always try to make your payment on time, but if circumstances become such that this is impossible, talk to your banker as soon as possible to make other arrangements. Well, you have been a good borrower over the year. You have always repaid your loans and developed a good credit rating, but you still have a large debt. A friend suggested that perhaps it would be wise to invest in some type of insurance to protect your family in the event something should happen to you. This would mean another monthly payment that would tighten your budget. After examining the options you decide to

   a. keep things the way they are and not add more costs to your already tight budget. (Go to #17.)

   b. take out a life insurance policy that would cover your debts in the event something happens to you. (Go to #5.)

9. No way. Loans should be used only for what they were intended. (Reread question #1.)

10. Wise choice. The chances of good rains and an excellent growing season every year are not extremely good. If you should have a poor crop or if there is a serious break in the farm price levels, this would tend to reduce your assets without reducing the financial obligations you have. Your net worth that was once adequate might be entirely wiped out. Keep your debts in line with your net worth. With all these loan possibilities coming up, it is time you found where a loan might be obtained. You are

SUPPLEMENT #9

fortunate to have two possibilities. You may go to the local bank or borrow from your brother-in-law Sam. Sam will loan you any amount, but may need it back if he goes south this winter. Also, he asks only a minor interest in your management decisions. The bank, on the other hand, wants a complete net-worth statement and requires some sort of a definite repayment schedule. Given these possibilities, you would choose to borrow from

a. your brother-in-law Sam. (Go to #2.)

b. the bank. (Go to #12.)

11. Wrong. Livestock equipment will last longer than a year, and repayments may be spread out over the equipments' life. (Reread #12.)

12. Wise choice. Often family members do not make the best loan officers. A dependable banker will not only get you the money you need, but can also be a great asset in making financial decisions. Keeping in touch with agriculture and the general problems experienced by many farmers is an added bonus for the dependable banker. Remember that selection of a dependable lender who will give the best terms possible is an asset to any farming operation. Well, now that you have decided to borrow the money from the bank, you should work on your repayment schedule. Throughout the next year you will borrow money for operating expenses and livestock equipment. Knowing that you will not be able to pay both types of loans off in one year, you would choose to pay off the ____________________ within the year.

    a. operating expenses (Go to #4.)

    b. livestock equipment expenses (Go to #11.)

13. Sorry, but chances are that you are wrong. Remember, the feeder pig salesperson is in the business of selling feeder pigs at top dollar. Check the other answer #15.

14. Wise choice. Farm production loans should be used for a purpose that will increase farm income. The motorcycle would be great, but lacks the ability to reproduce itself. Opportunity keeps knocking at your door. Two salespeople contact you about feeder livestock. One will give you a good deal on 100 head of cattle. In the past you have raised many cattle and see that an adequate profit can be realized by purchasing these cattle. The other salesperson has a load of 500 sheep she is willing to sell you at a very reasonable price. After penciling out feed costs, you conclude that a larger profit may be made on the sheep than on the cattle. You have never raised sheep, but feel a good profit is there for the claiming. You should

    a. buy the cattle. (Go to #18.)

    b. buy the sheep. (Go to #3.)

SUPPLEMENT #9

15. Good. You are on the right track. As long as you are doing an efficient job of farming with your old tractor it would be best to pass this offer up. Try to keep your debts as low as possible without reducing efficiency. Lately hogs have been higher than they ever have been. A feeder-pig producer tells you that prices will not drop. You have the facilities to raise 100 hogs. Assuming that you will have to secure a loan to buy the pigs, what would you do?

    a. Buy the pigs (Go to #13.)

    b. Not buy the pigs (Go to #20.)

16. Wishful thinking. Even if you had a good year, the chances of making a profit are very low. Wait for a better offer. (Go back to #20.)

17. Not too smart. You are gambling with the future of your family. How will they pay off your debts if you are gone? (Go back to #8.)

18. That is correct. Borrowing money for enterprises that you do not fully understand can be very dangerous. First, prove abilities in an unfamiliar enterprise by starting small before expanding it. Although you have just started farming, you know it will be your life's work. In time you hope to expand the 160 acres you farm to several hundred acres. Your neighbor has decided he is going out of farming and wants to sell his 160 horsepower tractor at a reasonable cost. Currently your largest tractor is only 100 horsepower, but it gets the job done with the equipment you have. If you do buy the larger tractor, it would allow you to get your field work done faster. Do you

    a. buy the larger tractor? (Go to #6.)

    b. keep the old tractor until you acquire more land? (Go to #15.)

19. Correct. It is important not only to use loan money for what it is intended, but to talk to your banker about possible farm improvements. Now that you have got your crop in, you are presented with a new opportunity. A neighbor is moving and wants to sell his motorcycle or beef cow. He needs the cash to pay some bills, so he will sell you either one for $400. After examining both possibilities you decide to secure a production loan and

    a. buy the cow. (Go to #14.)

    b. buy the motorcycle. (Go to #7.)

20. You are right. Although hog prices may remain at record highs, chances are they will not. Study the price trends and hog numbers over the past years and let that influence your decision. If prices go down, your profit potential goes with it. Eighty acres

SUPPLEMENT #9

of land comes up for rent in your area. The owner wants over $100 per acre cash rent for it. You figure you can break even if you can raise 115 bushels of corn per acre and sell it at a reasonable price. The owner told you that last year, with the good rains and excellent growing season, the corn did make 115 bushels per acre. If you could top that yield there could be a good profit. After viewing the profit potential you decide

a. not to rent the land. (Go to #10.)

b. rent the extra land. (Go to #16.)

21. Sorry, but you are wrong. Always inform your banker as early as possible if you have trouble making your payment. (Go back to #4.)

SUGGESTED ACTIVITIES

SUPPLEMENT #10 — CONSIDER CREDIT RESPONSIBILITIES

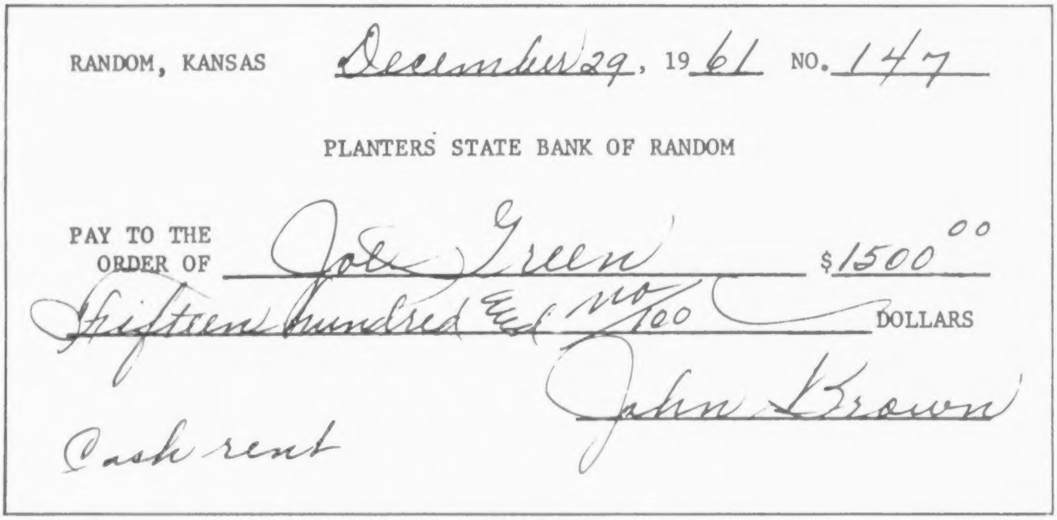
A person who uses credit assumes the following responsibilities:

- Reading the contract with care and making sure that he or she understands all of the terms
- Reviewing his or her financial situation and honestly determining whether or not he or she can afford credit
- Making payments promptly and according to the contract agreement
- Letting the creditor know as soon as possible when a payment cannot be met
- Paying penalties, as outlined in the contract, for delayed payments
- Accepting penalties, as agreed upon in the contract, for any failure to fulfill promises

A person who sells credit assumes the following responsibilities:

- Checking the borrower's credit rating and character references to determine his or her ability and intention to repay the loan before signing a contract
- Writing the contract so that the terms are clear, accurate, and legal
- Including all credit information before the contract is signed
- Accepting prepayment and refunding credit charges relating to the amount and time of the prepayment
- Paying the borrower any amount, in excess of the amount owed, that results from the sale of property reclaimed or put up as collateral
- Giving the borrower a copy of the contract

Credit Instruments



RANDOM, KANSAS December 29, 19 61 NO. 147

PLANTERS STATE BANK OF RANDOM

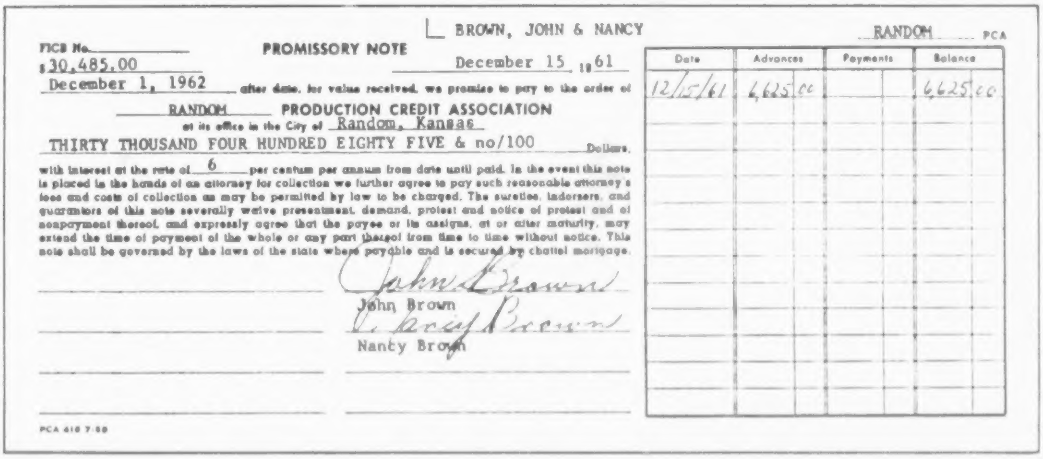
PAY TO THE ORDER OF Joe Green $1500 00

Fifteen hundred and no/100 DOLLARS

John Brown

Cash rent

Check



└ BROWN, JOHN & NANCY

RANDOM PCA

FICB No.

PROMISSORY NOTE

$30,485.00

December 15, 19 61

December 1, 1962 after date, for value received, we promise to pay to the order of

RANDOM **PRODUCTION CREDIT ASSOCIATION**

at its office in the City of Random, Kansas

THIRTY THOUSAND FOUR HUNDRED EIGHTY FIVE & no/100 Dollars,

with interest at the rate of 6 per centum per annum from date until paid. In the event this note is placed in the hands of an attorney for collection we further agree to pay such reasonable attorney's fees and costs of collection as may be permitted by law to be charged. The sureties, indorsers, and guarantors of this note severally waive presentment, demand, protest and notice of protest and of nonpayment thereof, and expressly agree that the payee or its assigns, at or after maturity, may extend the time of payment of the whole or any part thereof from time to time without notice. This note shall be governed by the laws of the state where payable and is secured by chattel mortgage.

John Brown
John Brown
Nancy Brown
Nancy Brown

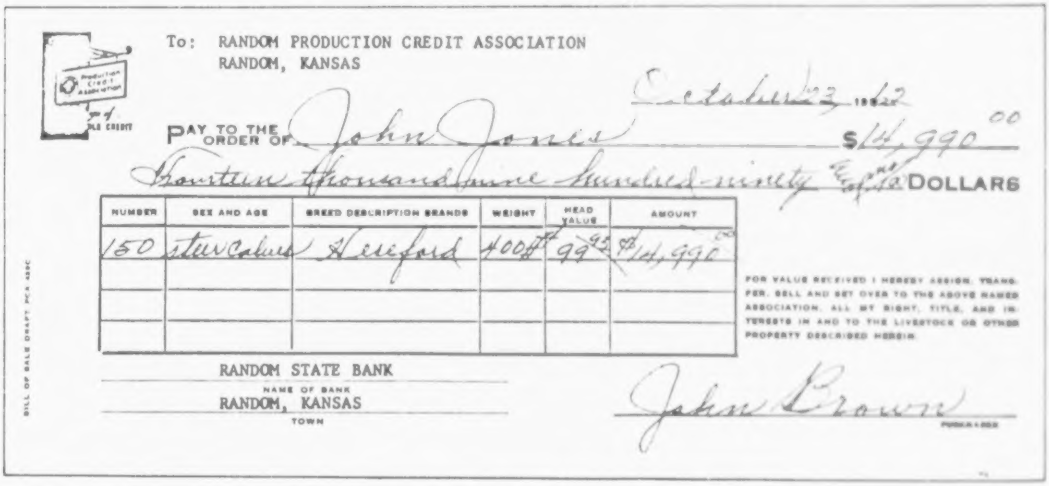
Date	Advances	Payments	Balance
12/15/61	6,625 00		6,625 00

PCA 410 7-58

Promissory Note

BEST COPY AVAILABLE

Credit Instruments
(Continued)



To: RANDOM PRODUCTION CREDIT ASSOCIATION
RANDOM, KANSAS

October 23, 1962

PAY TO THE ORDER OF John Jones $14,990.00

Fourteen thousand nine hundred-ninety & no/100 DOLLARS

NUMBER	SEX AND AGE	BREED DESCRIPTION BRANDS	WEIGHT	HEAD VALUE	AMOUNT
150	steer calves	Hereford	400#	99^{95}	$\$14,990^{00}$

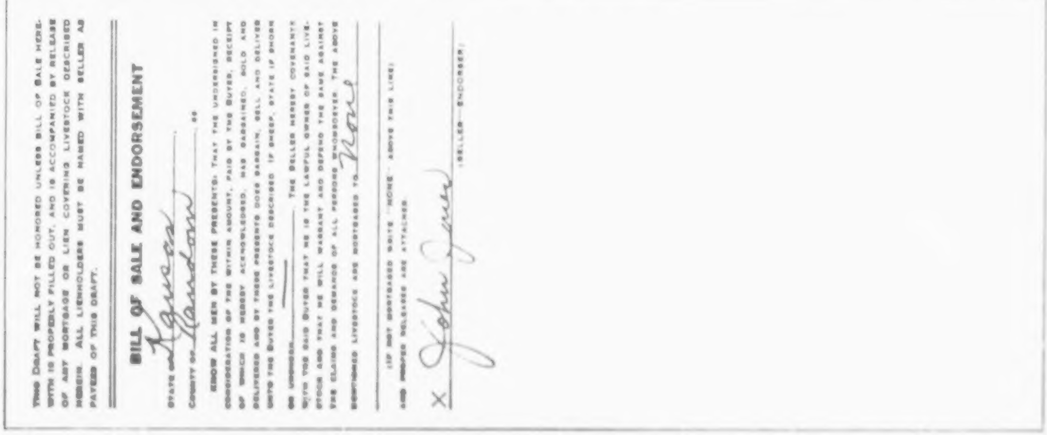
FOR VALUE RECEIVED I HEREBY ASSIGN, TRANSFER, SELL AND SET OVER TO THE ABOVE NAMED ASSOCIATION, ALL MY RIGHT, TITLE, AND INTERESTS IN AND TO THE LIVESTOCK OR OTHER PROPERTY DESCRIBED HEREIN.

RANDOM STATE BANK
NAME OF BANK
RANDOM, KANSAS
TOWN

John Brown

BILL OF SALE DRAFT PCA 430C

Bill of Sale Sight Draft
(Front)



THIS DRAFT WILL NOT BE HONORED UNLESS BILL OF SALE HEREWITH IS PROPERLY FILLED OUT, AND IS ACCOMPANIED BY RELEASE OF ANY MORTGAGE OR LIEN COVERING LIVESTOCK DESCRIBED HEREIN. ALL LIENHOLDERS MUST BE NAMED WITH SELLER AS PAYEES OF THIS DRAFT.

BILL OF SALE AND ENDORSEMENT

STATE OF Kansas
COUNTY OF Random } SS

KNOW ALL MEN BY THESE PRESENTS: THAT THE UNDERSIGNED IN CONSIDERATION OF THE WITHIN AMOUNT, PAID BY THE BUYER, RECEIPT OF WHICH IS HEREBY ACKNOWLEDGED, HAS BARGAINED, SOLD AND DELIVERED AND BY THESE PRESENTS DOES BARGAIN, SELL AND DELIVER UNTO THE BUYER THE LIVESTOCK DESCRIBED. IF SHEEP, STATE IF SHORN OR UNSHORN ——. THE SELLER HEREBY COVENANTS WITH THE SAID BUYER THAT HE IS THE LAWFUL OWNER OF SAID LIVESTOCK AND THAT HE WILL WARRANT AND DEFEND THE SAME AGAINST THE CLAIMS AND DEMANDS OF ALL PERSONS WHOMSOEVER. THE ABOVE MENTIONED LIVESTOCK ARE MORTGAGED TO None

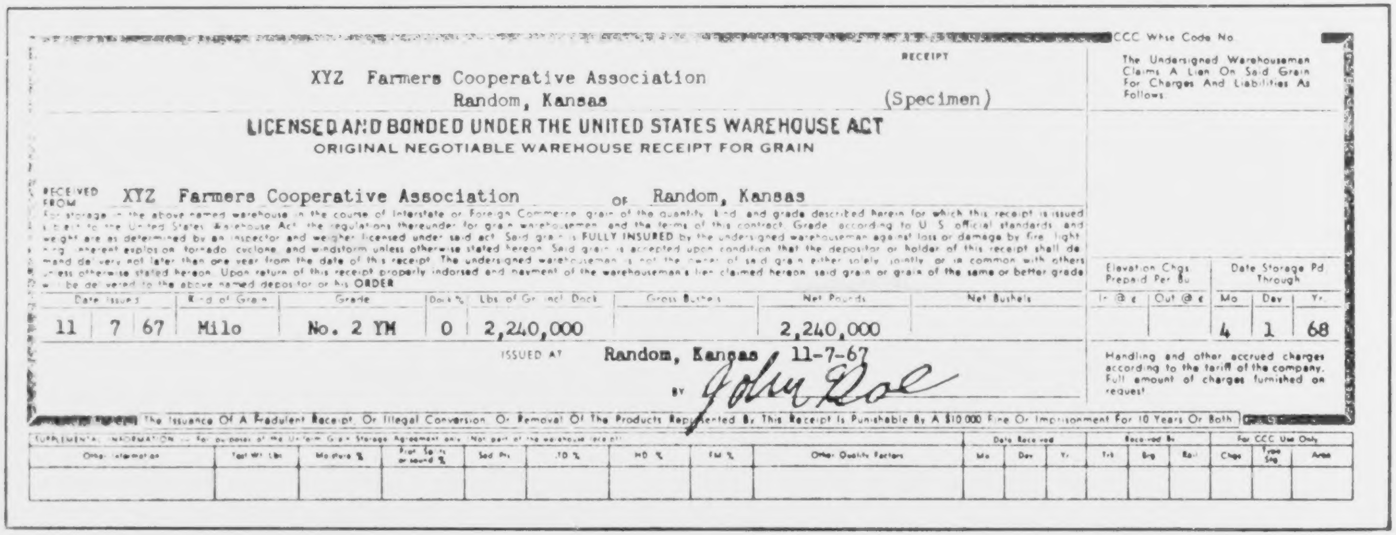
(IF NOT MORTGAGED WRITE "NONE" ABOVE THIS LINE)
AND PROPER RELEASES ARE ATTACHED.

× John Jones
(SELLER—ENDORSER)

Bill of Sale Sight Draft
(Back)

BEST COPY AVAILABLE

Credit Instruments
(Continued)



CCC Whse Code No.

RECEIPT

XYZ Farmers Cooperative Association
Random, Kansas

(Specimen)

The Undersigned Warehouseman Claims A Lien On Said Grain For Charges And Liabilities As Follows:

LICENSED AND BONDED UNDER THE UNITED STATES WAREHOUSE ACT
ORIGINAL NEGOTIABLE WAREHOUSE RECEIPT FOR GRAIN

RECEIVED FROM XYZ Farmers Cooperative Association OF Random, Kansas

For storage in the above named warehouse in the course of Interstate or Foreign Commerce grain of the quantity, kind, and grade described herein for which this receipt is issued subject to the United States Warehouse Act, the regulations thereunder for grain warehousemen, and the terms of this contract. Grade according to U. S. official standards and weight are as determined by an inspector and weigher licensed under said act. Said grain is FULLY INSURED by the undersigned warehouseman against loss or damage by fire, lightning, inherent explosion, tornado, cyclone, and windstorm unless otherwise stated hereon. Said grain is accepted upon condition that the depositor or holder of this receipt shall demand delivery not later than one year from the date of this receipt. The undersigned warehouseman is not the owner of said grain either solely, jointly, or in common with others unless otherwise stated hereon. Upon return of this receipt properly indorsed and payment of the warehouseman's lien claimed hereon, said grain or grain of the same or better grade will be delivered to the above named depositor or his ORDER

Date Issued			Kind of Grain	Grade	Dock %	Lbs. of Gr. incl. Dock	Gross Bushels	Net Pounds	Net Bushels	Elevation Chgs Prepaid Per Bu		Date Storage Pd Through		
										In @ ¢	Out @ ¢	Mo	Day	Yr
11	7	67	Milo	No. 2 YM	0	2,240,000		2,240,000				4	1	68

ISSUED AT Random, Kansas, 11-7-67

BY John Doe

Handling and other accrued charges according to the tariff of the company. Full amount of charges furnished on request

The Issuance Of A Fradulent Receipt, Or Illegal Conversion, Or Removal Of The Products Represented By This Receipt Is Punishable By A $10,000 Fine Or Imprisonment For 10 Years Or Both

SUPPLEMENTAL INFORMATION — For purposes of the Uniform Grain Storage Agreement only (Not part of the warehouse receipt)

Other Information	Test Wt. Lbs.	Moisture %	[illegible] or sound %	[illegible]	[illegible] %	HD %	FM %	Other Quality Factors	Date Received			Received By			For CCC Use Only		
									Mo	Day	Yr	Trk	Brg	Rail	Chge	Type Stg	Area

Warehouse Receipt

BEST COPY AVAILABLE

OBTAIN AND USE CREDIT
UNIT II

INFORMATION SHEET

I. Terms and definitions associated with obtaining and using credit

A. Credit — Capacity to borrow money

B. Collateral — Items pledged or mortgaged to secure a note

C. Uncertainty — Occurrence that cannot be assigned accurate odds on chances of its happening

D. Risk — Unfavorable occurrence that can be assigned reasonably accurate odds on chances of its happening

E. Financial leverage — Use of borrowed funds to supplement equity capital

F. Liquidity — Farm business's capacity to generate sufficient cash to meet its financial obligations as they fall due

G. Solvency — Farm business's ability to meet long-run claims against the business

H. Risk-bearing ability — Farm business's ability to compensate for variations in expenses and income as well as judgment errors in use of credit

I. Line of credit — Financial arrangement that provides funds to cover operating and capital expenses during a complete farming cycle, normally one year

J. Prime interest rate — Rate being charged by lender to best credit risk for short-term loans

(NOTE: The prime interest rate is normally used for large or special loan accounts.)

K. Base rate — Interest rate charged by lender that covers cost of money plus a reasonable profit

L. Annual percentage rate (APR) — Total finance charge on a loan, based upon compound interest table and expressed as an annual interest rate

M. Variable interest rate loans — Loans that provide a means by which interest rates may be lowered or raised, depending upon the cost of money in the markets

N. Amortization — Repayment of a loan with a regular series of payments over a specified period of time

O. Fixed interest rate loans — Loans that provide same rate of interest over the life of the loan

INFORMATION SHEET

II. Advantages and disadvantages of using credit

A. Advantages

1. Is a convenience

EXAMPLES: Need to carry large amounts of cash is eliminated; it is easier to return merchandise if it has not been paid for

2. Aids in recordkeeping and budgeting

EXAMPLES: Recordkeeping may be easier when one monthly payment is made; it is easier to keep a budget when one monthly payment is made; receipts are provided for tax purposes

3. Allows consumer to use goods while paying for them

4. Is a type of forced savings

(NOTE: Many people have difficulty setting aside money each month until they have to pay for the credit purchase of an expensive item.)

5. Enables consumer to meet financial emergencies

6. Allows consumer to take advantage of some bargains

B. Disadvantages

1. Weakens sales resistance

(NOTE: It is easier to buy now and pay later than it is to save for purchases.)

2. Can cause serious financial problems when consumer gets deeply into debt

3. Encourages impulse buying

4. Costs consumer money

5. Makes cost of goods and services higher

(NOTE: For instance, costs of goods are higher to cover the cost of paperwork, increased losses for bad debts, and cost of sending statements.)

6. Credit cards can be lost or stolen

INFORMATION SHEET

III. Types of credit

A. Production credit — Credit that generally returns its original cost plus an amount for interest profit

(NOTE: Production credit is usually treated as a part of the cost of doing business, the same as any other production input.)

B. Consumption credit — Credit for personal use rather than for a use that will generate future income

(NOTE: Consumption credit allows people to satisfy their present wants without first accumulating the necessary money.)

IV. Guidelines for building and maintaining a good credit standing

A. Establish a credit rating

B. Shop around for the best type of loan and interest rate

C. Get your credit from specialists

(NOTE: A lender who makes farm loans regularly will usually understand the farmer's problems and be sympathetic to the farmer's needs.)

EXAMPLES: Commercial banks, Federal Land Bank, Production Credit Association

D. Use the right type of credit

EXAMPLES: Short-term for seasonal operating expenses; intermediate-term for large equipment purchases; long-term for financing land or for capital improvements

E. Plan ahead for credit needs

EXAMPLE: Cash-flow projections

F. Borrow to make or save money

(NOTE: The cardinal rule for farm-business borrowing should be: *borrow only when the borrowed funds will make you more than the cost of borrowing them*.)

G. Plan the use of loan funds with your lender

H. Work out a repayment plan for every loan

INFORMATION SHEET

  - I. Meet your payments when due

    (NOTE: If unforeseen circumstances arise that may cause you to miss a payment, talk things over with the lender before the payment is due. Tell the lender what your problem is and when you expect to be able to make payment. It is important to express your intentions, even though you are temporarily unable to make payment.)

  - J. Avoid accumulating debts in several places

    (NOTE: Scattered borrowing is a sign to lenders that you are not planning your credit needs.)

  - K. Take an annual inventory

    (NOTE: An inventory will provide information for financial statements and will allow you to take a look at your financial position.)

- V. The three Cs of good credit

  (NOTE: The three Cs of good credit must be met before credit will be extended.)

  - A. Character

    (NOTE: Character is determined by integrity in money matters, honesty, reliability, willingness to pay, and record of financial responsibility.)

  - B. Capital

    (NOTE: Capital is measured by financial resources such as equity in a house, household goods, automobile, life insurance, and savings account.)

  - C. Capacity

    (NOTE: Capacity is judged by present and future income and by current financial commitments.)

- VI. Factors that a lender looks for in a borrower

  - A. Good character
  - B. Managerial ability
  - C. Stable financial position
  - D. Ability to repay
  - E. Sound purpose for loan
  - F. Adequate security for loan

INFORMATION SHEET

VII. Factors that a borrower looks for in a lender

- A. Good reputation
- B. Equitable policies
- C. Permanence and dependability
- D. Knowledge of agriculture
- E. Fair and competitive cost of credit

VIII. Indicators of good loan-repayment ability

- A. Good managerial ability
- B. Sufficient repayment capacity
- C. Product price rise
- D. Increase in size of operation
- E. Additional income

IX. Indicators of poor loan-repayment ability

- A. Low production per unit

  EXAMPLES: Poor crop yields, small calf crop, small returns from dairy

- B. Low price per unit sold

  EXAMPLES: Poor market, poor marketing, poor quality, low prices for product

- C. High cash production costs

  EXAMPLES: High feed costs, high labor costs, high replacement costs

- D. High cash overhead costs

  EXAMPLES: Heavy debt load, high interest rates, heavy taxes, high maintenance costs for buildings or machinery

- E. High cash living costs

  EXAMPLES: Sickness, education of children, extravagance

- F. Borrowing above the ability to repay

  EXAMPLE: Cash-flow projection not realistic enough

- G. Overestimating amount of loan that can be repaid each year

INFORMATION SHEET

X. Major types of credit extended by businesses

  A. Open-account credit

  (NOTE: This type of credit is often extended by services such as utility companies and doctors.)

    1. Customer may buy in person, by mail, or by telephone
    2. No down payment or interest is charged
    3. Statement is made and sent monthly
    4. Customer has stated period in which to repay with no interest charge

  B. Revolving charge account

    1. Maximum amount is usually established
    2. Payments are made monthly, depending on terms of the business

    (NOTE: Payments are usually 10 percent of the unpaid balance.)

    3. Interest is charged
    4. New purchases can be added, up to established amount of maximum

    EXAMPLE: Customer has a $400 credit limit and pays $40 per month plus 18% interest if the full amount of credit is used.

  C. Optional revolving credit

  (NOTE: This is a combination of the open and revolving credit accounts

    1. Business sends monthly bills
    2. Entire bill can be paid within agreed number of days after billing without interest

    (NOTE: This part is like an open account.)

    3. If entire bill is not paid, customer makes a monthly payment and the unpaid balance is subject to a service charge and/or interest

    (NOTE: Most major oil company credit cards operate this way. For instance, a bill for $30 could be paid in full without interest or the customer could pay $10 a month with interest.)

INFORMATION SHEET

D. Installment credit

1. Payments are made over a long period of time
2. Interest is charged
3. Service charge is sometimes added
4. Consumer has option of repaying entire amount at any time
5. If consumer does not maintain payments, merchandise may be repossessed

XI. Types of loans issued by banks and other lending institutions

(NOTE: Credit institutions are required to tell you the full costs of borrowing money.)

A. Collateral loan — Loan in which legal title to item purchased is held as security or collateral by lending institution

(NOTE: This type of loan is often used for expensive items such as vehicles.)

B. Life-insurance loan — Loan based on cash value of a person's permanent insurance policy

C. Secured personal loan — Loan made with collateral—such as blue chip stock—that is safe and will not lose value

(NOTE: The amount of the loan will be less than the market value of the collateral.)

D. Unsecured personal loan — Loan given to a customer with a good credit record based simply on customer's promise to repay

(NOTE: This type of loan is sometimes called a *signature loan*.)

E. Demand loan — Short-term loan (for less than one year) that is repaid in installments or in full at end of specified time period

F. Passbook loan — Arrangement that allows a person to borrow the amount in his or her savings account without having to withdraw the savings

(NOTE: The cost of borrowing on a savings account is low, and the savings continue to earn interest. The bank or savings and loan association holds custody of the passbook until repayment is made.)

G. Education loan — Loan to finance a post-secondary (after high school) education, with repayment usually deferred until after graduation

INFORMATION SHEET

H. Consolidated loan — Money borrowed to pay all debts

(NOTE: The money borrowed is repaid in smaller payments and over a longer period than it would take to pay off the debts separately.)

I. Credit-card loan — Using a bank credit card—such as VISA or Mastercharge—to finance purchases or to borrow cash

(NOTE: The borrower usually has three years to pay. While credit cards are convenient because there is no need to carry large amounts of cash and because the borrower can make one easy payment each month, it is important to remember that almost all types of credit include a substantial interest charge. If a person has a $500 credit limit and keeps his or her account close to that limit, the person's monthly minimum payment would be about $25. Chances are, more than $7 of that payment will be used to offset the interest charged for that month, leaving less than $18 to apply to the debt. In other words, for the privilege of not having to pay the full $500 at this time, the person pays about $25 for every $17 or $18 worth of merchandise.)

J. Check-credit loan — Bank loan automatically extended through borrower's checking account

(NOTE: There is usually a higher monthly service charge for this option.)

EXAMPLE: The borrower may write a check for $50 more than he or she has in a checking account and the bank automatically makes a loan to that person for $50.

K. Home-improvement loan — Special loan for the purpose of increasing the value of a home by adding a room, putting on a new roof, and so on

(NOTE: Home-improvement loans are usually extended for five years.)

L. Mortgage loan — Loan made on real estate, with the property pledged as security for loan

(NOTE: The amount of the loan is based on a percentage of the appraised value of the property, such as 90 percent or 95 percent of the appraised value. In other words, the borrower pays 5 to 10 percent of the appraised value as a down payment and borrows the rest. The larger the down payment, the lower the interest rate.)

M. FHA loan — Mortgage loan insured by the Federal Housing Authority

(NOTE: Certain standards must be met in order to obtain an FHA loan. The loan is usually less expensive than a conventional loan in which the bank assumes all the risks; however, the borrower pays an additional insurance cost of about 1/2 percent per year.)

INFORMATION SHEET

N. VA loan — Mortgage loan for eligible veterans in which the Veteran's Administration partially guarantees the loan

O. FmHA loan — Collateral or mortgage loans for eligible farm families in which the Farmers Home Administration partially guarantees the loan or makes the loan

(NOTE: Certain requirements must be met in order to obtain FmHA loans. Also, FmHA may have youth loans available for financing FFA projects.)

XII. Sources of farm credit

A. Commercial banks

B. Individuals

C. Merchants or dealers

D. Finance companies

E. Insurance companies

F. Federal Land Bank Associations

G. Production Credit Associations

H. Farmers Home Administration

I. Oklahoma Commissioners of the Land Office

XIII. Factors that determine the cost of credit

(NOTE: You should be aware that interest must be paid *before* the principal. For example, half of a house payment may be just for the interest.)

A. Purpose and type of loan

EXAMPLE: A loan with your home as collateral will have lower interest rates than a loan backed only by your promise to pay.

B. Economic conditions

EXAMPLE: During times of inflation, the government may cause interest rates to go higher in order to try to keep people from spending so much.

C. Individual's credit rating

EXAMPLE: If you pay your bills on time, you may be able to get lower interest rates.

D. Service cost of loan

EXAMPLES: Keeping records, liens, collections, profit for lender

XIV. Definitions of methods of computing interest

A. Simple interest — Amount paid for borrowing money that is repaid in a single lump sum

B. Remaining balance — Interest calculated by multiplying outstanding principal by contractual rate for period in question

C. Add-on — Interest based on original loan for entire period of loan; the sum of total interest and principal is divided by number of payments to obtain amount of each installment

D. Discount — Interest calculated on original amount of loan for full period of loan; this amount, plus any other loan costs, is subtracted from amount of loan at the beginning, with borrower receiving the difference

XV. Formula for calculating the true annual interest rate

$$\frac{\text{Total of Finance Charges}}{\text{1/2 of Original Loan}} \times \frac{\text{Number of Payments}}{\text{Number of Years}} \times \frac{1}{\text{Number of Payments Plus 1}} = \text{True Annual Interest Rate}$$

EXAMPLE: Johnny Jones purchased a used pickup for $4500. He made a down payment of $500. Johnny financed the remaining $4000 over two years at 14 percent interest. Using the add-on method for computing interest, Johnny's monthly payments were $213.33. His total finance charges were $1120, or

$$\frac{\$1120}{\$2000} \times \frac{24}{2} \times \frac{1}{25} = .2688 \times 100 = 26.88\% \text{ True Annual Interest Rate.}$$

(NOTE: Truth-in-lending legislation requires that the annual percentage rate [APR] be stated on all loan contracts. APR is more accurate in calculating annual rates than the true annual rate of interest, but APR is more complicated to calculate as it uses compound interest tables.)

XVI. Credit instruments

A. Check — Written form telling financial institution to pay a sum of money to person named on check

INFORMATION SHEET

B. Promissory note — Written promise of borrower to repay a certain sum of money to a certain person or bearer on demand or on a specified date

C. Draft — Order from one party to another directing that party to pay money to a third party

D. Mortgage — Legal assignment of property to a creditor as security for a debt—the assignment to be void upon completed payment of the debt

E. Bill of sale — Written statement certifying that the ownership of something has been transferred by sale

F. Warehouse receipt — Document given by a warehouseman for goods received for storage; evidence that the person named in the receipt has deposited with the warehouseman products of a specified amount and quantity

G. Financing statement — Form used to provide public information to the county clerk on the security for a loan

H. Security agreement — Document that spells out the rights and duties of both parties to a loan and gives the lender a security interest in the borrower's personal property, which is described therein

I. Loan application — Written application for a loan that shows the lender how much money is wanted, for what purpose it is to be used, and how and when the borrower plans to pay it back

J. Bill of lading — Contract or receipt signed by a common carrier agreeing to deliver the described freight to a given person at a stated place

K. Sales contract — Written agreement by one party to sell a property or a service to a second party for a stated price and under stated conditions

L. Net-worth statement — Sheet showing the financial condition at a definite time and listing all assets, values of assets, and liabilities of the farm or individual

(NOTE: Net-worth statements are also known as *balance sheets, financial statements,* or *statements of financial condition.*)

M. Cash-flow projection — An estimate of amount and timing of all cash inflows and cash outflows that are expected to occur throughout the planning period (usually one year)

OBTAIN AND USE CREDIT
UNIT II

ASSIGNMENT SHEET #1 — DETERMINE PERSONAL CREDIT STANDING

NAME ______________________________ DATE ______________

Determine your credit standing by answering the following questionnaire. Check (✓) either the "yes" or "no" response. The majority of your answers should fall under the "yes" response to qualify you as having a good credit standing.

WHAT KIND OF CREDIT RISK AM I?

Is my borrowing built around sound planning?	Yes	No
A. Do I have well-defined long-term SOEP and personal goals and objectives?	☐	☐
B. Is my lender acquainted with my long-term SOEP plan, including adjustments or changes in livestock systems, building improvements, equipment purchases, and cropping plans?	☐	☐
C. Is each loan request related to this long-term plan?	☐	☐
D. Do I borrow primarily for productive purposes?	☐	☐
Do I manage the personal nonfarm side of the farm business as well as the farm side?		
A. In case of a family financial emergency, do I first consult my regular agricultural lender?	☐	☐
B. Do I keep enough personal nonfarm records to know how much I spend and for what?	☐	☐
C. Are my larger personal expenditures planned in advance?	☐	☐
D. Are my valuable papers stored in a safe deposit box in a bank?	☐	☐
E. Do I and my family have a will or wills that make provision for the disposition of my SOEP?	☐	☐

Do I take every reasonable step in developing mutual understanding and trust between my lender and me?	Yes	No
A. Do I understand that my lender has legal and institutional lending limitations and responsibilities to depositors, stockholders, and governmental examiners?	☐	☐

(NOTE: The first step in mutual understanding is for each to be sympathetic to the other's problems, desires, and limitations.)

ASSIGNMENT SHEET #1

	Yes	No
B. Do I and my family consult my lender together when negotiating a loan? (NOTE: Families who share in major management decisions are considered better credit risks.)	☐	☐
C. Do I seek and respect my lender's counsel on important decisions?	☐	☐
D. Do I keep the lender fully informed on other debts, my progress or problems? (NOTE: In effect, do you give your lender all of the story?)	☐	☐
E. Do I have a credit "home"? (NOTE: You should not run up accounts and debts all over town, so that the lender will wonder how sound your loans really are.)	☐	☐
F. Do I understand the terms and obligations of the credit contract or note?	☐	☐
G. Do I respect due dates on notes and mortgages?	☐	☐
H. When repayment is difficult or impossible, do I see my lender in advance of the due date and not wait until the lender seeks me out because of delinquency?	☐	☐

Do I provide the lender with needed facts about my business?	**Yes**	**No**
A. Do I use net-worth statements periodically to show my real financial progress?	☐	☐
B. Do I budget expected incomes and expenses by months for each year?	☐	☐
C. Does my lender have an estimate of total credit needs and repayment plans for the entire year? (NOTE: Your estimates will not be perfect, but they are better than a wild guess.)	☐	☐
D. Is each loan request supported by a budget of expected incomes and expenses for that particular loan purpose?	☐	☐
E. Have I used my records to show strong and weak parts of my SOEP? To analyze costs? To determine cause of low income?	☐	☐

ASSIGNMENT SHEET #1

	Yes	No
F. Do I have and use records for forecasting feed requirements, yields, costs, etc.?	☐	☐
G. Do I have special record on my "bread and butter" enterprise?	☐	☐

(NOTE: A well-managed, expansive enterprise in which you are particularly skilled and which ideally fits your farm can be a good horse to ride. By furnishing detailed records, it may be easier to gain your lender's confidence so that a more liberal lending policy may be pursued. This may be a ticket to rapid but sound expansion.)

Do I act like a businessman or businesswoman and use progressive farming methods?

A. Do I keep fully informed on improved techniques and make (not put off) needed adjustments?	☐	☐
B. Do I farm enterprises in which the lender can develop confidence?	☐	☐
C. Do I devote adequate time to management?	☐	☐
D. Am I willing to use (but not abuse) credit just as any other productive tool in achieving needed size and efficiency in my SOEP?	☐	☐

OBTAIN AND USE CREDIT
UNIT II

ASSIGNMENT SHEET #2 — EVALUATE CREDIT AND LOAN SITUATIONS

NAME ______________________________ SCORE ____________

Evaluate credit and loan situations by reading the following case studies and answering the questions that follow. Discuss with the class.

A. After Paula graduated from high school, she interviewed for a job at a local bank and was hired. However, when she looked over her wardrobe, she realized that her school clothing was not suitable for this job. Until she received her first paycheck, she did not have the money to buy new clothes. She considered borrowing money from her parents, but her dad had been off work for three weeks with an injury, and she knew he could not afford to loan her money now. She decided to check with a local department store concerning the possibility of opening a charge account. She found the credit manager at the store very pleasant and helpful.

Since she had worked at a part-time job while in high school and had good references, the store opened a charge account in Paula's name. This allowed her to purchase enough clothes to dress properly for her new job.

What types of credit were probably available from the department store?

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________

B. Bob worked with his father on their farm after school and on weekends. Bob's father decided they needed a new piece of farm equipment; however, at the present time they did not have the cash to purchase the equipment. Because Bob's father was not familiar with types of loans associated with farm equipment, a friend suggested that he go to a finance company to borrow the money. It was easy to qualify for a loan at the finance company because the company did not require credit references.

In school, Bob had studied credit buying and had learned that finance companies, in some cases, charge much higher interest rates than other lending institutions. After more consideration, Bob's dad talked to a loan officer at the local bank and found that the bank would loan the money, using the equipment as collateral. Comparing the interest rate of the bank with the interest rate of the finance company, Bob and his dad found that they could save a considerable amount by borrowing from the bank.

What guideline for obtaining a loan was applied here?

____

ASSIGNMENT SHEET #2

C. Jim recently began attending the state university. He moved into a new apartment that did not have a refrigerator. Jim checked and found that by borrowing the cash from the bank he could purchase the appliance at a savings of 10 percent on the purchase price. Because he had been working only a short time and had not opened a checking or savings account at the bank, the bank would not make a loan to him. Jim then decided to purchase the refrigerator on the installment plan at the department store, even though this method of buying cost him more.

1. What advantage of using credit is illustrated here?

2. If Jim makes his payments promptly and establishes a good credit rating, will it be easier for him to borrow money from the bank next time?

D. Jean moved to the sales department in the company where she worked. The move meant that she would be traveling considerably and would need to purchase a smaller, more economical car. When she found the car she wanted, she checked with several lending institutions to determine the best way to finance the car. After checking with the bank, the finance company, and her company's credit union, Jean found that she would get a lower interest rate and also lower monthly payments through the credit union.

What guideline for obtaining a loan was applied here?

OBTAIN AND USE CREDIT
UNIT II

ASSIGNMENT SHEET #3 — CALCULATE INTEREST EXPENSE

NAME ____ SCORE ________________

In order to be able to shop around for the right loan at the best interest rate, you must be able to calculate interest expense.

Practice calculating interest expense by using each of the following methods of computing interest. Use the formula in Section XV of the Information Sheet to calculate true annual interest rates.

PART I — Simple-interest method

Simple interest is calculated by multiplying the amount of money borrowed (the principal) times the contractual interest rate, times the length of time (in years of fractions thereof) the money is used.

EXAMPLE: A loan of $1000 for one year at 9 percent interest rate—

Amount Borrowed × Interest Rate × Length of Loan = Simple Interest

$1000 × .09 × 1 = $90.00 Simple Interest

A. How much interest would be paid for the use of $2300 for six months at 18 percent interest rate?

Simple interest = ____

B. How much interest would be paid for the use of $3600 for nine months at 15 percent interest rate?

Simple interest = ____

C. What is the true annual interest rate for problem B above?

True annual interest rate = ____

PART II — Remaining-balance method

(NOTE: The remaining-balance method is used on many operating loans and may be used on loans with constant principal payments or constant payments, commonly known as *amortized loans*. Interest on the unpaid balance is sometimes referred to as *constant principal payments*.)

Interest on the unpaid or remaining balance is calculated by adding a given payment amount and the interest figured on the amount actually owned in any given time.

ASSIGNMENT SHEET #3

EXAMPLE: To figure interest at 1 percent per month on the unpaid balance of a $100 loan to be paid in twelve monthly payments—

1. Divide $100 by 12 to find the amount you pay on the principal each month—which is $8.33;
2. Figure the interest on $100 at 1 percent, and add it to the monthly principal: .01 × $100 = $1.00 and $8.33 + $1.00 = $9.33 for the first month's payment;
3. Subtract $8.33 each month from the principal left at the end of the previous month: $100 − $8.33 = $91.67;
4. Figure the interest on the monthly difference ($91.67 in this example) at 1 percent and add to the monthly principal: .01 × $91.57 = .92 and $8.33 + .92 = $9.25 for the second month's payment. The payment is figured the same way each month.

A. Assume that you have purchased an irrigation system for $70,000. You paid 10 percent down and financed the remainder over ten years at 12 percent interest. You plan to make ten annual payments. How much interest will you pay over the ten-year period?

Interest over ten-year period = ____________________________________

Repayment Schedule				Unpaid Balance
Year	Total payment	Interest	Principal	
Beginning	XXXX	XXXXX	XXXXXX	$63,000
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Totals				

B. What is the true annual interest rate for Problem A above?

True annual interest rate = ____________________________________

ASSIGNMENT SHEET #3

PART III — Remaining-balance method, using amortization table

A constant payment loan using the remaining-balance method may also be calculated by determining the loan balance, the number of periods to be repaid, and the interest rate and using an amortization table.

EXAMPLE: Assume that you purchased a moldboard plow for $5000 and financed the entire amount at 15 percent interest with five annual payments—

1. Using the amortization table below, follow the year column to the number 5. Move across the table on the year 5 line until the 15 percent column is reached; record the decimal number (.2983);
2. Multiply the decimal number times the amount of the loan to find the annual payment: .2983 × $5000 = $1491.50;
3. Multiply the annual payment times the number of annual payments to determine the total amount paid: $1491.50 × 5 = $7457.50;
4. Subtract the amount of the loan from the total amount paid to determine the total interest paid: $7457.50 − $5000 = $2457.50.

Annual Payment per $1 of Loan at Given
Interest Rates and Maturities
(Amortization Table)

Year	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	1.0400	1.0500	1.0600	1.0700	1.0800	1.0900	1.1000	1.1100	1.1200	1.1300	1.1400	1.1500	1.1600	1.1700	1.1800	1.1900	1.2000
2	.5301	.5378	.5454	.5530	.5607	.5684	.5761	.5839	.5916	.5994	.6072	.6151	.6229	.6308	.6387	.6466	.6545
3	.3603	.3672	.3741	.3810	.3880	.3950	.4021	.4092	.4163	.4235	.4307	.4379	.4452	.4525	.4599	.4673	.4747
4	.2754	.2820	.2885	.2952	.3019	.3086	.3154	.3223	.3292	.3361	.3432	.3502	.3573	.3645	.3717	.3789	.3862
5	.2246	.2309	.2373	.2438	.2504	.2570	.2637	.2705	.2774	.2843	.2912	.2983	.3054	.3125	.3197	.3270	.3343
6	.1907	.1970	.2033	.2097	.2163	.2229	.2296	.2363	.2432	.2501	.2571	.2642	.2713	.2786	.2859	.2932	.3007
7	.1666	.1728	.1791	.1855	.1920	.1986	.2054	.2122	.2191	.2261	.2331	.2403	.2476	.2549	.2623	.2698	.2774
8	.1485	.1547	.1610	.1674	.1740	.1806	.1874	.1943	.2013	.2083	.2155	.2228	.2302	.2376	.2452	.2528	.2606
9	.1344	.1406	.1470	.1534	.1600	.1667	.1736	.1806	.1876	.1948	.2021	.2095	.2170	.2246	.2323	.2401	.2480
10	.1232	.1295	.1358	.1423	.1490	.1558	.1627	.1698	.1769	.1842	.1917	.1992	.2069	.2146	.2225	.2304	.2385
11	.1141	.1203	.1267	.1333	.1400	.1469	.1539	.1611	.1684	.1758	.1833	.1910	.1988	.2067	.2147	.2228	.2311
12	.1065	.1128	.1192	.1259	.1326	.1396	.1467	.1540	.1614	.1689	.1766	.1844	.1924	.2004	.2086	.2168	.2252
13	.1001	.1064	.1129	.1196	.1265	.1335	.1407	.1481	.1556	.1633	.1711	.1791	.1871	.1953	.2036	.2121	.2206
14	.0946	.1010	.1075	.1143	.1212	.1284	.1357	.1432	.1508	.1586	.1666	.1746	.1828	.1912	.1996	.2082	.2168
15	.0899	.0963	.1029	.1097	.1168	.1240	.1314	.1390	.1468	.1547	.1628	.1710	.1793	.1878	.1964	.2050	.2138
16	.0858	.0922	.0989	.1058	.1129	.1203	.1278	.1355	.1433	.1514	.1596	.1679	.1764	.1850	.1937	.2025	.2114
17	.0821	.0886	.0954	.1024	.1096	.1170	.1246	.1324	.1404	.1486	.1569	.1653	.1739	.1826	.1914	.2004	.1094
18	.0789	.0855	.0923	.0994	.1067	.1142	.1219	.1298	.1379	.1462	.1546	.1631	.1718	.1807	.1896	.1986	.2078
19	.0761	.0827	.0896	.0967	.1041	.1117	.1195	.1275	.1357	.1441	.1526	.1613	.1701	.1790	.1881	.1972	.2064
20	.0735	.0802	.0871	.0943	.1018	.1095	.1174	.1255	.1338	.1423	.1509	.1597	.1686	.1776	.1862	.1960	.2053
25	.0646	.0709	.0782	.0858	.0936	.1018	.1101	.1187	.1275	.1364	.1454	.1546	.1640	.1734	.1829	.1924	.2021
30	.0578	.0650	.0726	.0805	.0888	.0973	.1060	.1150	.1241	.1334	.1428	.1523	.1618	.1715	.1812	.1910	.2008
35	.0535	.0610	.0689	.0772	.0858	.0946	.1036	.1129	.1223	.1318	.1414	.1511	.1608	.1707	.1805	.1904	.2003
40	.0505	.0505	.0664	.0750.	.0838	.0929	.1022	.1117	.1213	.1309	.1407	.1505	.1604	.1703	.1802	.1901	.2001

ASSIGNMENT SHEET #3

A. Assume that you purchased an irrigation system for $70,000. You paid 10 percent down and financed the remainder over ten years at 12 percent interest. You plan to make ten annual payments. Use the amortization table to calculate the following:

1. Annual payment ______________________________

2. Total payment paid ______________________________

3. Total interest paid ______________________________

B. What is the true annual interest rate for problem A?

True annual interest rate = ______________________________

C. How does the interest on the unpaid balance (constant principal payment) compare with the constant payment in the purchase and financing of the irrigation equipment.

____

____

____

____

PART IV — Add-on interest method

In the add-on interest method, the amount of each installment is calculated by adding the interest to the loan and dividing by the total number of payments.

EXAMPLE: You borrow $100 at 15 percent interest to be paid back in twelve monthly installments--

1. Find the interest by multiplying the loan amount by the interest rate: $100 × .15 = $15.00;

2. Add the interest to the loan amount to find total payments: $15.00 + $100 = $115.00;

3. Divide the total payments by the number of monthly installments to determine the amount of each installment: $115 ÷ 12 = $9.58.

   (NOTE: The true annual interest rate is 27.69 percent. You pay interest on money you have already paid back.)

ASSIGNMENT SHEET #3

A. Assume that you have purchased a new refrigerator for your home. The total purchase cost of $1150 was financed by the appliance dealer at 9 percent add-on interest rate to be paid back in thirty-six monthly installments. What is the amount of each installment?

Amount of each monthly installment = ______________________

B. What is the true annual interest rate for problem A above?

True annual interest rate = ______________________

PART V — Discount-interest method

The discount-interest method is calculated by subtracting the interest from the loan amount, with the borrower receiving the difference.

EXAMPLE: You borrow $100 for one year at a 6 percent discount rate. You would receive $94.00 ($100 – $6 interest), and you would repay $100.

(NOTE: The true annual interest rate is 6.38 percent.)

A. You have decided to go to college and have qualified for a student-guaranteed loan. The loan will be for $3600 at a 9 percent discount rate. How much would you receive of the loan proceeds if the loan was to be repaid in one year?

Loan proceeds received = ______________________

B. What is the true annual interest rate for problem A above?

True annual interest rate = ______________________

OBTAIN AND USE CREDIT
UNIT II

ASSIGNMENT SHEET #4 — COMPARE FINANCING METHODS

NAME ____________________________________ SCORE ______________

Read the following case study and compare the financing options available to the farmer in the study. Compare and analyze the financing methods by working the problems that follow.

Case Study

A local farmer is considering buying a tractor. The tractor may be purchased for $55,000, and the farmer may finance the tractor in one of the following three ways:

1. **Dealer financed**, the terms are a five-year loan with equal annual payments, interest at 10 percent figured by the *add-on method*, no interest charged for the first year

2. **Bank financed**, the terms are a five-year loan with equal annual payments, and interest at 12 percent figured with the *amortization table* below

Annual Payment per $1 of Loan at Given
Interest Rates and Maturities
(Amortization Table)

Year	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	1.0400	1.0500	1.0600	1.0700	1.0800	1.0900	1.1000	1.1100	1.1200	1.1300	1.1400	1.1500	1.1600	1.1700	1.1800	1.1900	1.2000
2	.5301	.5378	.5454	.5530	.5607	.5684	.5761	.5839	.5916	.5994	.6072	.6151	.6229	.6308	.6387	.6466	.6545
3	.3603	.3672	.3741	.3810	.3880	.3950	.4021	.4092	.4163	.4235	.4307	.4379	.4452	.4525	.4599	.4673	.4747
4	.2754	.2820	.2885	.2952	.3019	.3086	.3154	.3223	.3292	.3361	.3432	.3502	.3573	.3645	.3717	.3789	.3862
5	.2246	.2309	.2373	.2438	.2504	.2570	.2637	.2705	.2774	.2843	.2912	.2983	.3054	.3125	.3197	.3270	.3343
6	.1907	.1970	.2033	.2097	.2163	.2229	.2296	.2363	.2432	.2501	.2571	.2642	.2713	.2786	.2859	.2932	.3007
7	.1666	.1728	.1791	.1855	.1920	.1986	.2054	.2122	.2191	.2261	.2331	.2403	.2476	.2549	.2623	.2698	.2774
8	.1485	.1547	.1610	.1674	.1740	.1806	.1874	.1943	.2013	.2083	.2155	.2228	.2302	.2376	.2452	.2528	.2606
9	.1344	.1406	.1470	.1534	.1600	.1667	.1736	.1806	.1876	.1948	.2021	.2095	.2170	.2246	.2323	.2401	.2480
10	.1232	.1295	.1358	.1423	.1490	.1558	.1627	.1698	.1769	.1842	.1917	.1992	.2069	.2146	.2225	.2304	.2385
11	.1141	.1203	.1267	.1333	.1400	.1469	.1539	.1611	.1684	.1758	.1833	.1910	.1988	.2067	.2147	.2228	.2311
12	.1065	.1128	.1192	.1259	.1326	.1396	.1467	.1540	.1614	.1689	.1766	.1844	.1924	.2004	.2086	.2168	.2252
13	.1001	.1064	.1129	.1196	.1265	.1335	.1407	.1481	.1556	.1633	.1711	.1791	.1871	.1953	.2036	.2121	.2206
14	.0946	.1010	.1075	.1143	.1212	.1284	.1357	.1432	.1508	.1586	.1666	.1746	.1828	.1912	.1996	.2082	.2168
15	.0899	.0963	.1029	.1097	.1168	.1240	.1314	.1390	.1468	.1547	.1628	.1710	.1793	.1878	.1964	.2050	.2138
16	.0858	.0922	.0989	.1058	.1129	.1203	.1278	.1355	.1433	.1514	.1596	.1679	.1764	.1850	.1937	.2025	.2114
17	.0821	.0886	.0954	.1024	.1096	.1170	.1246	.1324	.1404	.1486	.1569	.1653	.1739	.1826	.1914	.2004	.1094
18	.0789	.0855	.0923	.0994	.1067	.1142	.1219	.1298	.1379	.1462	.1546	.1631	.1718	.1807	.1896	.1986	.2078
19	.0761	.0827	.0896	.0967	.1041	.1117	.1195	.1275	.1357	.1441	.1526	.1613	.1701	.1790	.1881	.1972	.2064
20	.0735	.0802	.0871	.0943	.1018	.1095	.1174	.1255	.1338	.1423	.1509	.1597	.1686	.1776	.1862	.1960	.2053
25	.0646	.0709	.0782	.0858	.0936	.1018	.1101	.1187	.1275	.1364	.1454	.1546	.1640	.1734	.1829	.1924	.2021
30	.0578	.0650	.0726	.0805	.0888	.0973	.1060	.1150	.1241	.1334	.1428	.1523	.1618	.1715	.1812	.1910	.2008
35	.0535	.0610	.0689	.0772	.0858	.0946	.1036	.1129	.1223	.1318	.1414	.1511	.1608	.1707	.1805	.1904	.2003
40	.0505	.0505	.0664	.0750.	.0838	.0929	.1022	.1117	.1213	.1309	.1407	.1505	.1604	.1703	.1802	.1901	.2001

3. **Bank financed**, the terms are a five-year loan with equal annual principal payments, interest at 12 percent figured by the *remaining-balance method*

ASSIGNMENT SHEET #4

A. Which method of financing should the farmer choose if there is no limit on the amount of the annual payment?

____

B. Assuming that the farmer could afford to pay a maximum of $15,000 the first year, which method should be chosen?

____

OBTAIN AND USE CREDIT
UNIT II

ASSIGNMENT SHEET #5 — DETERMINE WHEN TO BORROW

NAME ______________________________ SCORE ______________

Mary Landlover is to determine which would be the most economical way to finance crop expenses this year. She has the following expenses.

Item		Payment terms
Oil and fuel	$ 3,050	30 days free then 2.5% interest/month
Fertilizer	14,400	30 days free then 1.66% interest/month
Herbicide	6,300	30 days free then 1.66% interest/month
Tractor repairs	900	no free days, must be paid right away
Seed wheat	3,500	no free days at 1% interest/month
Seed soybeans	900	no free days at 1% interest/month

Mary also has 3000 bushels of wheat and 2000 bushels of soybeans on storage in the local elevator. Storage costs are 10¢ per bushel for the first three months and 2¢ per bushel thereafter.

Mary finds she can borrow any amount of money for 17% interest per year at the local bank. She estimates the following prices for her wheat and soybeans:

	Price per bushel	
Delivery date	Wheat	Soybeans
Now	$3.50	$6.75
3 months	3.65	6.95
6 months	3.75	7.10

Mary has also determined that she will sell part of this year's crop in six months for $15,000.

Using the information given above, determine which of the following credit options would be most economical for Mary to use. Show your work in the spaces provided.

Option A — Borrow the entire amount from the bank to pay the crop expenses and sell the wheat and soybeans in six months

ASSIGNMENT SHEET #5

Option B — Sell the wheat and soybeans now, pay off what bills she can, and borrow the remainder needed until the new crop is sold in six months

Option C — Borrow the money to pay the tractor repair bill, sell the wheat and soybeans in six months, and then pay off the rest of the bills

Option D — Borrow the entire amount to pay bills. Sell the wheat and soybeans at three months and pay on bank note. Pay off remainder of bank note when new crop is sold in six months.

Which option would be most economical for Mary to choose? ________________________

OBTAIN AND USE CREDIT
UNIT II

ASSIGNMENT SHEET #6 — COMPLETE AN APPLICATION FOR CREDIT

NAME ____ SCORE ________________

When you apply for credit, you will probably be asked to fill out an application form like the one on the following page. Practice filling out an application for credit by completing the following sample application.

ASSIGNMENT SHEET #6

Travel Card Application

APP | A/C No. (For Office Use Only) | 00 | LN | IN | ST

PAC 20 | CR CK 24 | CC 09 | CR -11 BEG SUB | TC 12

Please Print

Name - First Initial Last

Phone No. ( ) Area

Spouse's Name If Permitted To Use Account

Home Address No. Street Apt. No.

Are You Of Legal Age?

Number Of Dependents

☐ Own
☐ Buying
☐ Rent

☐ Home
☐ Mobile Home
☐ Apartment
☐ Live With Parents

City State Zip

Years At Address

Type Of Account Desired ☐ Individual ☐ Joint

Number Of Cards Desired

Social Security No.

Previous Address (If Above Less Than 2 Years)

No. Street City State

Years At Address

For Reference Only—Any Relative With Account

Account No. (If Known) Name Relationship

Employer's Name Phone No.

Years Employed

Complete For Joint Account, If Any

Name

Of Legal Age

Address

Employer's Name

Years Employed

Job Title Or Military Rank

Employee Or Badge No.

Salary Monthly

Address

Former Employer (If Above Less Than 2 Years Or Retired)

Years Employed

Job Title Or Military Rank

Employee Or Badge No.

Salary Monthly

Disclosure Of Alimony, Child Support Or Maintenance Payments Are Optional
Other Income (Source)

Amount Monthly

Disclosure Of Alimony, Child Support Or Maintenance Payments Are Optional
Other Income (Source)

Amount Monthly

Credit Accounts Firm Name
Oil Companies

Address

Account Number

Firm Name
Other

Address

Account Number

Firm Name
Other

Address

Account Number

Bank Name

Account Number

Address

Type Accounts ☐ Loan ☐ Checking ☐ Savings

Auto Financed By

Address

Loan Number

	Make	Year	Amount Owing
Cards To Be Used For			

Estimated Monthly Purchases
☐ $50 Or Less
☐ $50 To $100
☐ $100 To $200
☐ Over $200

Nearest Relative (Not At Applicant's Address)

Name

Relationship

No. Street City State

Please Read Carefully Before Signing

The undersigned requests that an account be opened for the undersigned and card(s) issued as indicated herein and renewed and replaced, and in connection therewith authorizes ________ or its designee to receive and exchange information, and to investigate the references and other data collected pertaining to credit responsibility of the undersigned. FULL PAYMENT OF ACCOUNT DUE AND PAYABLE UPON RECEIPT OF MONTHLY STATEMENT. Any past due balance will be subject to a FINANCE CHARGE computed at the ANNUAL PERCENTAGE RATE and monthly periodic rate shown on monthly statements. If this application is accepted and one or more credit cards are issued, my acceptance and use of the credit card(s) evidences my agreement to all the terms and conditions in the materials and information accompanying the card(s). It is understood that each party to a joint account is fully liable for all charges to the joint account.

Signature ________ Date ________ If Joint Account, Other Signature ________ Date ________

IMPORTANT NOTICE—DETACH AND RETAIN

"The Federal Equal Credit Opportunity Act prohibits creditors from discriminating against credit applicants on the basis of sex or marital status. The Federal Agency which administers compliance with this law concerning this oil company is the Federal Trade Commission, Washington, D.C., 20580."

OBTAIN AND USE CREDIT
UNIT II

ASSIGNMENT SHEET #7 — COMPLETE AN APPLICATION FOR AN AGRICULTURAL LOAN

NAME ______________________________ SCORE ______________

Lenders require certain information from borrowers. This information may include a financial statement (net-worth statement), a cash-flow projection, and the purpose of the loan. A financial statement is a statement of the financial condition of the borrower at a specified time. A cash-flow projection is an estimate of the monthly cash inflow and outflow for a certain period, usually one year.

The purpose of this assignment is to help Joe Youngfarmer begin completing the forms necessary to apply for an agricultural loan. Using the following information from Joe's FFA record books, complete a financial statement for an agricultural loan.

(NOTE: Normally Joe's lender requires Joe to complete a cash-flow projection in addition to a financial statement. Because Joe completed a cash-flow projection when applying for his operating note in October, 1985, Joe's lender is not requiring a cash-flow projection at this time.)

The date is January 2, 1986. Joe Youngfarmer is planning to participate in the government grazeout program and is anticipating purchasing two hundred 600-pound stocker steers for $78,000. Joe has planned for the purchase of the steers in a cash-flow projection previously submitted to his lender. The lender has asked Joe to set the steers up on a note separate from his operating note and to submit a financial statement as of January 1, 1986.

Joe has recently received the FFA American Farmer degree and has been keeping his farm records in the *FFA Record Book*. Use the following beginning inventory form and beginning net-worth statement from Joe's record book to complete much of the information required on his lender's financial statement. Joe's lender is Anytown Bank, Anytown, Oklahoma.

Joe is the son of John Youngfarmer and has been farming and renting from his dad since his freshman year in agriculture. They share equipment and labor from time to time. In June, 1984, Joe married his childhood sweetheart, Pretty. Joe owns 40 acres (35 acres cropland and 5 acres farmstead). He rents an additional 600 acres from his dad. He cash rents 185 acres of pasture for $10 per acre. Joe rents on a crop-share basis (1/3) 415 acres of crop land.

Joe and Pretty's farm is located 4 miles east of Anytown. Their mailing address is Rt. #1, Anytown, Oklahoma. They will need the following additional information to complete the financial statement.

- Life insurance: Face value ($50,000), cash value ($2100); no borrowings; beneficiary is Pretty Youngfarmer; the right to change beneficiary is reserved

Joe and Pretty have real estate taxes due and payable in January, 1986, of $235.00. They also estimate their income taxes for 1985 to be $2800.

ASSIGNMENT SHEET #7

• Machinery and equipment:	Date purchased	Cost
JD tractor	July/1981	$31,000
Brushhog	July/1981	1,200
Moldboard plow	August/1983	4,200
Offset disk	August/1983	4,500
Drill	August/1985	3,250
½ ton pickup	September/1985	10,239
Two-door sedan	July/1983	6,200
Springtooth	August/1982	2,500
Stock trailer	August/1982	4,000
Water tank	October/1985	225
Electric supplies	—	500

- Land and mobile home were purchased in June, 1984. The land and improvements (including well, septic system, machine shed, fences, and terracing) were purchased for $40,000. The land purchase was financed at 11.5 percent interest over twenty-five years. Monthly payments are $355.60 per month and the note will be paid off in June, 2009. Current loan balance is $34,900. The 14′ × 80′ mobile home was purchased for $11,500 and was financed by Friendly Mobile Homes. The original amount of the loan was $8000 and was financed for ten years at 12 percent interest. Monthly payments are $114.80 per month and the note will be paid off in June, 1994. Current loan balance is $7500.

- Loans:

  In May, 1983, Joe purchased fifteen crossbred cows from his dad, John. John financed the cattle with a repayment schedule of $1000 annual principal payment plus 10 percent interest on the unpaid balance. The payment is due each May. Current loan balance is $3200.

  Joe negotiated an operating loan in October, 1985, to plant 450 acres of wheat and feed his cattle through the winter. The original amount and current balance are $20,000. The note will be paid off in one payment due July 19, 1986. The interest rate was 14 percent.

  Joe purchased a 1982 Olds Cutlass two-door sedan in July, 1983. The car was financed by GMAC. Monthly payments are $168.45. Current balance is $1347. The note will be paid in August, 1986.

  Last year, Joe and Pretty, purchased a new 1985 half-ton Chevrolet pickup. The note was financed by GMAC. Monthly payments are $217.40. Current balance is $9800. The note will be paid in August, 1990.

- Joe works part time at a machinery dealership. His off-farm earnings were $9500 last year. Pretty began teaching school in the fall last year. Her earnings for the year were $8700.

- Joe does not farm in partnership with his dad. They do, however, share equipment and labor. Joe has his wheat custom-harvested.

ASSIGNMENT SHEET #7

- Joe and Pretty have never filed for bankruptcy. There are no judgments or suits against the Youngfarmers at this time.
- Joe and Pretty have the following insurance coverage: Buildings—$20,000; machinery and equipment—$30,000; and liability—$50,000. No other insurance is provided.
- Joe and Pretty have resided at their present location one year and six months. Joe previously lived with his dad, John Youngfarmer.
- This financial statement will be dated at 1:30 P.M. this second day of January, 1986.
- Joe is 22 years old and Pretty 21.

ASSIGNMENT SHEET #7

BEGINNING INVENTORY

January 1, 1986

Item or Description	Total Value		Value to the Enterprise											
			1 Wheat		2 Beef		3		4		5		6 Agribusiness	
Wheat - 1,000 bu. @ 3.55	3,550	00	3,550	00										
Native Hay - 15 bales @ 25.00	375	00			375	00								
Alfalfa Hay - 10 bales @ 55.00	550	00			550	00								
10 - Reg. Hereford Cows 1,000 lbs. ea. @ 650.00	6,500	00			6,500	00								
1 - Reg. Hereford Bull 1,200 lbs.	650	00			650	00								
5 - Reg. Hereford Replacement Heifers 750 lbs. ea. @ 500.00	2,500	00			2,500	00								
15 - Crossbred Cows 1,000 lbs. ea. @ 500.00	7,500	00			7,500	00								
8 - Hereford Heifer Calves 550 lbs. @ 368.50	2,948	00			2,948	00								
14 - Crossbred Heifer Calves 550 lbs. @ 368.50	5,159	00			5,159	00								
10 - Hereford & Crossbred Steers 600 lbs. ea. @ 432.00	4,320	00			4,320	00								
JD 110 HP Tractor	19,500	00	19,500	00										
6 ft. Brushhog	600	00			600	00								
(4 x 18') MB Plow	3,200	00	3,200	00										
14 ft. Offset Disk	3,150	00	3,150	00										
12 ft. Drill	3,000	00	3,000	00										
1985 Chev. ½ ton Pickup	10,000	00	10,000	00										
Electric Fence Supplies	350	00			350	00								
20 ft. Springtooth	1,500	00			1,500	00								
16 ft. Stock Trailer	3,200	00			3,200	00								
1,200 gal. Water Tank	200	00			200	00								
450 acres growing wheat @ 35.00	15,750	00	15,750	00										
Totals— Beginning Inventory	94,502	00	58,150	00	36,352	00								

ASSIGNMENT SHEET #7

STUDENT'S NET-WORTH STATEMENT

A. Student's Assets	Beginning Date 1-1-86	Ending Date ____
1. Total inventory value (from pages 8 and 9)	$\$94{,}502^{00}$	$ ____
2. Accounts receivable (from page 10)	$\$0^{00}$	$ ____
3. Cash money on hand	$\$55^{00}$	$ ____
4. Checking account	$\$1{,}785^{00}$	$ ____
5. Savings account	$\$4{,}230^{00}$	$ ____
6. Other investments (cash surrender on bonds, cash surrender value of life insurance, postal savings, etc.) Life Insurance ($\$50{,}000$ Face Value) cash value	$\$2{,}100^{00}$	$ ____
____	$ ____	$ ____
40 Acres - farmstead	$\$40{,}000^{00}$	$ ____
14 x 80 Mobile Home	$\$10{,}000^{00}$	$ ____
1982 Olds Cutlass - 2 door	$\$4{,}000^{00}$	$ ____
A. TOTAL ASSETS	$\$156{,}672^{00}$	$ ____
B. Student's Liabilities		
1. Unpaid bills	$\$2{,}123^{00}$	$ ____
2. Accounts payable (notes and mortgages) from page 10 operating loan	$\$20{,}000^{00}$	$ ____
3. Other liabilities (specify) John Youngfarmer - ($\overset{\text{15 cows}}{\$3200^{00}}$);	$\$56{,}747^{60}$	$ ____
Pickup note ($\$9{,}800^{00}$); Car note ($\$1{,}347^{60}$);	$ ____	$ ____
Land note ($\$34{,}900^{00}$); Mobile Home note ($\$7{,}500^{00}$)	$ ____	$ ____
B. TOTAL LIABILITIES	$\$78{,}870^{60}$	$ ____

NET WORTH (A minus B) Beginning $\$77{,}801^{40}$

NET WORTH (A minus B) Ending $ ____

(CAUTION: Beginning net-worth values in this book must be the same as the ending net-worth values of the previous book and ending net worth values of this book must be the same as the beginning net-worth values of the next book.)

ASSIGNMENT SHEET #7

FINANCIAL STATEMENT FOR STOCKMAN OR FARMER

Name ____________________ Address ____________________
To ____________________

The following statement and information are furnished by the undersigned for the purpose of obtaining credit from your bank from time to time. The statement represents my true financial condition on ____________, 19____. You may consider this statement as continuing to be true and correct until written notice of any change is given to you by the undersigned.

(FILL IN ALL BLANKS. INDICATE "NO" OR "NONE" WHERE NECESSARY.)

ASSETS

	Amount	
CURRENT ASSETS		
Cash on hand and in banks (including checking and savings accounts and certificates of deposit) ________	$	
Government bonds and securities ________		
Cash value of life insurance $ ________ Less Borrowing $ ________		
Other investments (Schedule 1) ________		
Farm products, grain and feed on hand (Schedule 2)		
Livestock (Schedule 3) ________		
All other current assets (itemize)		
________		
________		
________		
Total Current Assets	$	
FIXED ASSETS		
Farm machinery and automotive equipment (Schedule 4) ________		
Farm and ranch lands less exemption $ ________ (Schedule 5) ________		
Other real estate (Schedule 6) ________		
Other fixed assets (itemize) ________		
________		
________		
________		
Total Fixed Assets	$	
Total Assets	$	

LIABILITIES AND NET WORTH

	Amount	
CURRENT LIABILITIES (DUE IN 12 MONTHS)		
Unsecured notes payable to banks (Schedule 7)	$	
Loans secured by livestock (Schedule 8)		
Loans on farm machinery and automotive equipment (Schedule 9)		
Other loans (Schedule 10) ________		
Accounts payable (hardware, feed, vet, repairs, etc.) ________		
Interest due and payable ________		
Payroll taxes ________		
Real estate taxes due and payable		
Income taxes due and payable (federal and state)		
Income taxes estimated for current year (federal and state) ________		
All other current debits (itemize)		
________		
________		
Total Current Liabilities	$	
LONG-TERM LIABILITIES		
Liens on farm and ranch land (Schedule 11) ________		
Liens on other real estate (Schedule 12) ________		
All other long-term debts (itemize)		
________		
________		
Total Long-Term Liabilities	$	
Total Liabilities	$	
Net Worth		
Total Liabilities and Net Worth	$	

Used with permission of Stillwater National Bank, Stillwater, Oklahoma.

ASSIGNMENT SHEET #7

SCHEDULE 1 — OTHER INVESTMENTS
(Includes Stocks and Bonds)

NAME OF ISSUER	TYPE OF INVESTMENT	MATURITY	PURCHASE PRICE	CURRENT VALUE
			$	$
TOTALS			$	$

SCHEDULE 2 — FARM PRODUCTS, FEED, AND GRAIN ON HAND

CROP	QUANTITY (BU, BALE, CWT)	WHERE STORED	PRICE PER UNIT	TOTAL VALUE
				$
TOTAL				$

SCHEDULE 3 — LIVESTOCK

CLASS	BREED	NUMBER OF HEAD	AVERAGE WEIGHT PER HEAD	MARKET VALUE PER HEAD	TOTAL VALUE
					$
TOTAL					$

ASSIGNMENT SHEET #7

SCHEDULE 4 — FARM MACHINERY AND AUTOMOTIVE EQUIPMENT

DESCRIPTION	MAKE	QUANTITY	PURCHASED		PRESENT VALUE
			DATE	COST	
				$	$
TOTALS				$	$

SCHEDULE 5 — FARM AND RANCH LANDS

ACREAGE	LOCATION	DESCRIPTION OF IMPROVEMENTS	MARKET VALUE
			$
TOTAL			$

SCHEDULE 6 — OTHER REAL ESTATE

DESCRIPTION	LOCATION	MARKET VALUE
		$
TOTAL		$

ASSIGNMENT SHEET #7

SCHEDULE 7 — UNSECURED NOTES PAYABLE TO BANKS

NAME OF BANK	PURPOSE OF LOAN	ORIGINAL AMOUNT	AMOUNT OWED	WHEN DUE	REPAYMENT PLAN
		$	$		
TOTAL			$		

SCHEDULE 8 — LOANS SECURED BY LIVESTOCK

LENDER	SECURITY		AMOUNT OWED	WHEN DUE	REPAYMENT PLAN
	TYPE	NO. OF HEAD			
			$		
TOTAL			$		

SCHEDULE 9 — LOANS ON FARM MACHINERY AND AUTOMOTIVE EQUIPMENT

LENDER	DESCRIPTION	AMOUNT OWED	WHEN DUE	REPAYMENT PLAN
		$		
TOTAL		$		

SCHEDULE 10 — OTHER LOANS (NON-REAL ESTATE)

NAME OF LENDER	PURPOSE OF LOAN	ORIGINAL AMOUNT	AMOUNT OWED	WHEN DUE	REPAYMENT PLAN
		$	$		
TOTAL			$		

ASSIGNMENT SHEET #7

SCHEDULE 11 — LIENS ON FARM AND RANCH LANDS

LENDER	ACREAGE AND LOCATION	ORIGINAL AMOUNT	AMOUNT OWED	REPAYMENT PLAN
		$	$	
TOTAL			$	

SCHEDULE 12 — LIENS ON OTHER REAL ESTATE

LENDER	DESCRIPTION AND LOCATION	ORIGINAL AMOUNT	AMOUNT OWED	REPAYMENT PLAN
		$	$	
TOTAL			$	

ASSIGNMENT SHEET #7

SUPPLEMENTAL INFORMATION

Taxes paid to ______________________, 19____. Mortgage interest is paid to ______________________, 19____. I lease ________ acres of (crop) (pasture) land from others in ______________________ (County and State). The annual rental on this land is $ ______________________ and is paid to ______________________, 19____.

Endorsements and guaranties for others (amounts and maturities) ______________________

Have you any partners in your business? __________ If so, state particulars ______________________

Have you ever been adjudged a bankrupt? __________ If so, state particulars ______________________

Judgments or suits pending against me at this time $ __________ state particulars ______________________

Life insurance $ __________ payable to ______________________. Is the right to change beneficiary reserved? ______________________

Insurance on: Buildings $ __________ Grain $ __________ Livestock $ __________

Machinery and Automotive Equipment $ __________ Liability $ __________

I have resided at present location __________ years __________ months. Formerly resided ______________________

I CERTIFY THAT THE STATEMENT ON THE REVERSE SIDE AND THE SCHEDULES AND INFORMATION ABOVE ARE CORRECT

DATED AT ______________ *THIS* ________ *DAY OF* ______________ *19*____.

BEFORE SIGNING, SEE THAT ALL QUESTIONS HAVE BEEN ANSWERED AND ALL BLANKS FILLED.

Witness: ______________________ (Signed) ______________________

Age ____ yrs. ☐ Married ☐ Unmarried ☐ Separated
(Fill in only on application for secured credit, if required for compliance with loan or finance charge ceilings, or if applicant resides in a community property state.)

Subscribed and sworn to before me this ________ day of ______________, 19____

(Notary Public in and for ______________________)

(SEAL)

My commission expires ______________, 19____.

STATEMENTS SUBMITTED TO FEDERAL RESERVE BANK MUST EITHER BE SIGNED ORIGINALS OR CERTIFIED COPIES. IF COPIES ARE FUNISHED, FOLLOWING CERTIFICATE MUST BE OFFICIALLY SIGNED BY MEMBER BANK.

WE HEREBY CERTIFY THAT THE FOREGOING IS A TRUE AND CORRECT COPY OF A SIGNED FINANCIAL STATEMENT OF THE ABOVE-MENTIONED INDIVIDUAL, FIRM, OR CORPORATION NOW ON FILE IN THIS BANK, AND THAT, TO THE BEST OF OUR KNOWLEDGE AND BELIEF, THIS STATEMENT REFLECTS THE TRUE CONDITION OF THE BORROWER.

NAME OF MEMBER BANK ______________________

OFFICIAL SIGNATURE AND TITLE ______________________

STATEMENTS CERTIFIED BY PUBLIC ACCOUNTANTS MAY, IN THE DISCRETION OF THE DISCOUNT COMMITTEE OF THE FEDERAL RESERVE BANK, BE ACCEPTED.

OBTAIN AND USE CREDIT
UNIT II

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1 — Evaluated to the satisfaction of the instructor

Assignment Sheet #2

A. 1. Open account

2. Revolving charge account

3. Optional revolving credit

4. Installment credit

B. Shop around for the best type of loan and interest rate

C. 1. Credit enables people to meet financial emergencies, allows customers to use goods while paying for them, and allows customers to take advantage of some bargains.

(NOTE: Other answers may be accepted, if justified.)

2. Yes

D. Shop around for the best type of loan and interest rate

Assignment Sheet #3

PART I

A. $\$2300 \times .18 \times {}^{6}/_{12} = \$207$

B. $\$3600 \times .15 \times {}^{9}/_{12} = \$405$

C. $\frac{\$405}{\$1800} \times \frac{1}{.75} \times \frac{1}{2} = .15$ or 15%

ANSWERS TO ASSIGNMENT SHEETS

PART II

A.

Repayment Schedule				Unpaid Balance
Year	Total payment	Interest	Principal	
Beginning	XXXX	XXXXX	XXXXXX	$63,000
1	13,860	7,560	6,300	56,700
2	13,104	6,804	6,300	50,400
3	12,348	6,048	6,300	44,100
4	11,592	5,292	6,300	37,800
5	10,836	4,536	6,300	31,500
6	10,080	3,780	6,300	25,200
7	9,324	3,024	6,300	18,900
8	8,568	2,268	6,300	12,600
9	7,812	1,512	6,300	6,300
10	7,056	756	6,300	—0—
Totals	104,580	41,580	63,000	XXX

B. $\frac{\$41,580}{\$31,500} \times \frac{10}{10} \times \frac{1}{11} = .12$ or 12%

PART III

A. 1. .1769 × $63,000 = $11,144.70 Annual Payment

2. $11,144.70 × 10 years = $111,447.00 Total Payment

3. $111,447.00 − $63,000 = $48,447.00 Total Interest Paid

B. $\frac{\$48,447}{\$31,500} \times \frac{10}{10} \times \frac{1}{11} = .1398$ or 13.98%

C. Answer should include the following: Constant principal payment has higher payments in beginning years ($13,860 to $11,144.70); lower payments in the closing year ($7056 to $11,144.70); lower amount of total interest paid ($41,580 to $48,447)

ANSWERS TO ASSIGNMENT SHEETS

PART IV

A.

	$1150	Loan
×	.09	Interest Rate
	$103.50	Annual Interest
×	3	Years
	$310.50	Total Interest

	$1150	Loan
+	310.50	Total Interest
	$1460.50	

$$\frac{\$1460.50}{36} = \$40.57 \text{ Monthly Installment}$$

B. $\frac{\$310.50}{\$575} \times \frac{36}{3} \times \frac{1}{37} = .175 \text{ or } 17.5\%$

PART V

A.

	$3600	Loan
×	.09	Interest Rate
	$ 324	Interest

	$3600	Loan
−	324	Interest
	$3276	Loan Proceeds Received

B. $\frac{\$324}{\$1638} \times \frac{1}{1} \times \frac{1}{2} = .0989 \text{ or } 9.89\%$

Assignment Sheet #4

A. Remaining-balance method at 12 percent would be chosen because less interest would be paid

Logic behind solution:

Method #1 — Add-on at 10% interest rate

	$55,000	Loan
×	.10	Interest Rate
	$ 5,500	
×	4	Years (1st year interest free)
	$22,000	Total Interest

	$55,000	Loan
+	22,000	Total Interest
	$77,000	Total Payment

$77,000 ÷ 5 Equal Payments = $15,400 Annual Payments

$$\frac{\$22,000}{\$27,500} \times \frac{5}{5} \times \frac{1}{6} = 13.3\% \text{ True Annual Interest Rate}$$

ANSWERS TO ASSIGNMENT SHEETS

Method #2 — Equal annual payments at 12% interest rate

	.2774	(From Amortization Table)
×	$55,000	Loan
	$15,257	Annual Payment
×	5	Years
	$76,285	Total Payments
−	55,000	Loan
	$21,285	Total Interest Paid

$\frac{\$21,285}{\$27,500} \times \frac{5}{5} \times \frac{1}{6} =$ 12.9% True Annual Interest Rate

Method #3 — Equal annual principal payments at 12% interest rate

Repayment Schedule				Unpaid Balance
Year	Total payment	Interest	Principal	
Beginning	XXXX	XXXX	XXXX	$55,000
1	$17,600	$ 6600	$11,000	44,000
2	16,280	5280	11,000	33,000
3	14,960	3960	11,000	22,000
4	13,640	2640	11,000	11,000
5	12,320	1320	11,000	0
Totals	$74,800	$19,800	$55,000	XXXX

$\frac{\$19,800}{\$27,500} \times \frac{5}{5} \times \frac{1}{6} =$ 12.0% True Annual Interest Rate

B. Equal annual payments would be chosen over the add-on method because less interest would be paid. The remaining-balance method could not be considered because the first year payment exceeded $15,500.

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #5

Option B would be the most economical solution for Mary

(NOTE: If expenses or prices change, the solution may be different.)

Logic behind solution:

Option A — Expenses:

$29,050 Crop Expenses
+ 800 Storage Expenses
29,850
× .085 Interest (17% @ 6 months)
2,537.25 Interest Expense

5000 Bushels
× .16 (10¢ for 1st 3 months + 2¢ for every month after)
$ 800

29,850.00
2,537.25
$32,387.25 Total Expenses

Income:

3000 Bushels Wheat @ $3.75 = $11,250
2000 Bushels Soybeans @ $7.10 = 14,200
New Crop Income = 15,000
$40,450 Total Income

Net Income:

$40,450.00
- 32,387.25
$ 8,062.75 Net Income

Option B — Income:

3000 Bushels Wheat @ $3.50 = $10,500
2000 Bushels Soybeans @ $6.75 = 13,500
Old Crop Income $24,000
New Crop Income 15,000
$39,000 Total Income

Expenses:

Crop Expense = $29,050
Old Crop Income − 24,000
Amount to Be Financed = $ 5,050
Loan Interest (17% @ 6 months) × .085
Interest Expense 429.25
$29,479.25 Total Expenses

Net Income:

$39,000.00
- 29,479.25
$ 9,520.75 Net Income

ANSWERS TO ASSIGNMENT SHEETS

Option C — Income:
3000 Bushels Wheat @ $3.75 = $11,250
2000 Bushels Soybeans @ $7.10 = 14,200
New Crop Income = 15,000
$40,450 Total Income

Expenses:
Tractor Bill = $900
Interest @ × .085
(17% @ 6 mos.) $ 76.50
Total Tractor Bill = $976.50

Fertilizer Bill = $14,400
Interest @ × .083
(1.66%/mo. @ 5 mos.) $ 1,195.20
Total Fertilizer Bill = $15,595.20

Oil and Fuel Bill = $ 3,050
Interest @ × .125
(2.5% month @ 5 mos.) $ 381.25
Total Oil and Fuel bill = $ 3,431.25

Herbicide Bill = $ 6,300
Interest @ × .083
(1.66%/mo. @ 5 mos) $ 522.90
Total Herbicide Bill $ 6,822.90

Seed Wheat and Soybean Bill = $4,400 5000 Bushels
Interest @ × .06 × .16
(1% month @ 6 months) $ 264 $800.00 Storage
Total Seed Wheat and Soybean Bill = $4,664 Expense

Tractor = $ 976.50
Oil and fuel = 3,431.25
Fertilizer = 15,595.20
Herbicide = 6,822.90
Seed = 4,664.00
Storage = 800.00
$32,289.85 Total Expenses

Net Income:
$40,450.00
– 32,289.85
$ 8160.15 Net Income

ANSWERS TO ASSIGNMENT SHEETS

Option D —	Income:	3000 Bushels Wheat @ $3.65	= $10,950	
		2000 Bushels Soybeans @ $6.95	= 13,900	
		Old Crop Income (sold in 3 mos.)	$24,850	
		New Crop Income	15,000	
			$39,850	Total Income

Expenses:	Crop Expenses	= $29,050	
	Interest	× .0425	(17% @ 3 months)
	Interest Expense	= $ 1,234.63	
	Storage	= 500.00	(5000 bu. @ 10¢/bu)
	3 Month Balance	= $30,784.63	
	Old Crop Income	= 24,850.00	
	Balance to Be Financed	$ 5,934.63	
	Interest	× .0425	(17% @ 3 months)
	Interest Expense	= $ 252.22	
	Crop Expenses	= $29,050.00	
	Interest Expenses	= 1,486.85	
	Storage	= 500.00	
		$31,036.85	

Net Income:	$39,850.00	
	– 31,036.85	
	$ 8,813.15	Net Income

Assignment Sheet #6 — Evaluated to the satisfaction of the instructor

(NOTE: All lines should have an answer.)

Assignment Sheet #7 — See following pages

ANSWERS TO ASSIGNMENT SHEETS

FINANCIAL STATEMENT FOR STOCKMAN OR FARMER

Name Joe Youngfarmer Address Rt. #1 Anytown, OK
To Anytown Bank

The following statement and information are furnished by the undersigned for the purpose of obtaining credit from your bank from time to time. The statement represents my true financial condition on January 1, 19 86. You may consider this statement as continuing to be true and correct until written notice of any change is given to you by the undersigned.

(FILL IN ALL BLANKS. INDICATE "NO" OR "NONE" WHERE NECESSARY.)

ASSETS

	Amount	
CURRENT ASSETS		
Cash on hand and in banks (including checking and savings accounts and certificates of deposit)	$ 6	070^{00}
Government bonds and securities		0^{00}
Cash value of life insurance $ 2,100^{00} Less Borrowing $ 0^{00}	2	100^{00}
Other investments (Schedule 1)		0^{00}
Farm products, grain and feed on hand (Schedule 2)	4	475^{00}
Livestock (Schedule 3)	29	577^{00}
All other current assets (itemize)		
Total Current Assets	$42	222^{00}
FIXED ASSETS		
Farm machinery and automotive equipment (Schedule 4)	48	700^{00}
Farm and ranch lands less exemption $ ______ (Schedule 5)	40	000^{00}
Other real estate (Schedule 6)	10	000^{00}
Other fixed assets (itemize)		
Total Fixed Assets	$98	700^{00}
Total Assets	$140	922^{00}

LIABILITIES AND NET WORTH

	Amount	
CURRENT LIABILITIES (DUE IN 12 MONTHS)		
Unsecured notes payable to banks (Schedule 7)	$	0^{00}
Loans secured by livestock (Schedule 8)	3	200^{00}
Loans on farm machinery and automotive equipment (Schedule 9)	11	147^{60}
Other loans (Schedule 10)	20	000^{00}
Accounts payable (hardware, feed, vet, repairs, etc.)	2	123^{00}
Interest due and payable		0^{00}
Payroll taxes		0^{00}
Real estate taxes due and payable		235^{00}
Income taxes due and payable (federal and state)		0^{00}
Income taxes estimated for current year (federal and state)	2	800^{00}
All other current debits (itemize)		
Total Current Liabilities	$39	293.^{60}
LONG-TERM LIABILITIES		
Liens on farm and ranch land (Schedule 11)	34	900^{00}
Liens on other real estate (Schedule 12)	7	500^{00}
All other long-term debts (itemize)		
Total Long-Term Liabilities	$42	400^{00}
Total Liabilities	$81	693.^{60}
Net Worth	59	228.^{40}
Total Liabilities and Net Worth	$140	922.^{00}

ANSWERS TO ASSIGNMENT SHEETS

SCHEDULE 1 — OTHER INVESTMENTS
(Includes Stocks and Bonds)

NAME OF ISSUER	TYPE OF INVESTMENT	MATURITY	PURCHASE PRICE	CURRENT VALUE
None			$	$
TOTALS			$	$

SCHEDULE 2 — FARM PRODUCTS, FEED, AND GRAIN ON HAND

CROP	QUANTITY (BU, BALE, CWT)	WHERE STORED	PRICE PER UNIT	TOTAL VALUE
Wheat	1,000 bu.	John Youngfarmer's (Dad)	3.55	$ 3,550.00
Native Hay	15 bales	Farm	25.00	375.00
Alfalfa Hay	10 bales	Farm	55.00	550.00
TOTAL				$ 4,475 00

SCHEDULE 3 — LIVESTOCK

CLASS	BREED	NUMBER OF HEAD	AVERAGE WEIGHT PER HEAD	MARKET VALUE PER HEAD	TOTAL VALUE
Cows	Registered Hereford	10	1000	650.00	$ 6,500.00
Cows	Crossbred	15	1000	500.00	7,500.00
Bull	Registered Hereford	1	1200	650 00	650.00
Replacement Heifers	Registered Hereford	5	750	500.00	2,500.00
Heifer Calves	Hereford	8	550	368.50	2,948.00
Steer Calves	Hereford & Crossbred	10	600	432.00	4,320.00
Heifer Calves	Crossbred	14	550	368.50	5,159.00
TOTAL					$ 29,577.00

ANSWERS TO ASSIGNMENT SHEETS

SCHEDULE 4 — FARM MACHINERY AND AUTOMOTIVE EQUIPMENT

DESCRIPTION	MAKE	QUANTITY	PURCHASED		PRESENT
			DATE	COST	VALUE
Tractor	J.D. 110 HP	1	7/81	$ 31,000.00	$ 19,500.00
Brushhog	16 ft.	1	7/81	1,200.00	600.00
Plow	Mold board (4x18)	1	8/83	4,200.00	3,200.00
Offset Disk	14 ft.	1	8/83	4,500.00	3,150.00
Drill	12 ft.	1	8/85	3,250.00	3,000.00
½ ton Pickup	1985 Chevrolet	1	9/85	10,239.00	10,000.00
2 door Sedan	1982 Olds Cutlass	1	7/83	6,200.00	4,000.00
Springtooth	20 ft.	1	8/82	2,500.00	1,500.00
Stock trailer	16 ft.	1	8/82	4,000.00	3,200.00
Water tank	1,200 gal.	1	10/85	225.00	200.00
Electric fence	Supplies		—	500.00	350.00
TOTALS				$	$ 48,700.00

SCHEDULE 5 — FARM AND RANCH LANDS

ACREAGE	LOCATION	DESCRIPTION OF IMPROVEMENTS	MARKET VALUE
40 Acres	Farm - 4 mi. E.	Well, septic system, machine shed, farmstead fenced, terraces	$ 40,000.00
TOTAL			$ 40,000.00

SCHEDULE 6 — OTHER REAL ESTATE

DESCRIPTION	LOCATION	MARKET VALUE
14x80' Mobile Home	Farm	$ 10,000.00
TOTAL		$ 10,000.00

ANSWERS TO ASSIGNMENT SHEETS

SCHEDULE 7 — UNSECURED NOTES PAYABLE TO BANKS

NAME OF BANK	PURPOSE OF LOAN	ORIGINAL AMOUNT	AMOUNT OWED	WHEN DUE	REPAYMENT PLAN
None		$	$		
TOTAL			$		

SCHEDULE 8 — LOANS SECURED BY LIVESTOCK

LENDER	SECURITY		AMOUNT OWED	WHEN DUE	REPAYMENT PLAN
	TYPE	NO. OF HEAD			
John Young Farmer		15	$ 3,200.00	May	$1000 + 10% interest annually until paid
TOTAL			$ 3,200.00		

SCHEDULE 9 — LOANS ON FARM MACHINERY AND AUTOMOTIVE EQUIPMENT

LENDER	DESCRIPTION	AMOUNT OWED	WHEN DUE	REPAYMENT PLAN
GMAC	1985 1/2 ton Pickup	$ 9,800.00	monthly	$217.40/month (repay 8/90)
GMAC	1982 2 door Cutlass	1347.60	monthly	$168.45/month (repay 8/86)
TOTAL		$ 11,147.60		

SCHEDULE 10 — OTHER LOANS (NON-REAL ESTATE)

NAME OF LENDER	PURPOSE OF LOAN	ORIGINAL AMOUNT	AMOUNT OWED	WHEN DUE	REPAYMENT PLAN
Anytown Bank	operating loan	$ 20,000.00	$ 20,000.00	July 19, 1986	Single payment
TOTAL		$20,000.00	$		

ANSWERS TO ASSIGNMENT SHEETS

SCHEDULE 11 — LIENS ON FARM AND RANCH LANDS

LENDER	ACREAGE AND LOCATION	ORIGINAL AMOUNT	AMOUNT OWED	REPAYMENT PLAN
Anytown Bank	40 Acres - 4 mi. E.	$36,000.00	$34,900.00	$355.60/month @ 11.5% interest for 25 yrs. expected pay off June, 2009
TOTAL			$34,900.00	

SCHEDULE 12 — LIENS ON OTHER REAL ESTATE

LENDER	DESCRIPTION AND LOCATION	ORIGINAL AMOUNT	AMOUNT OWED	REPAYMENT PLAN
Friendly Mobile Homes	14x80 Mobile Home - Farm	$ 8,000.00	$ 7,500.00	$114.80/month @ 12% interest for 10 yrs. expected pay off June, 1994
TOTAL			$7,500.00	

ANSWERS TO ASSIGNMENT SHEETS

SUPPLEMENTAL INFORMATION

Taxes paid to January 1, 1987. Mortgage interest is paid to January 1, 1986. I lease 600 acres of (crop) (pasture) land from others in Any County, OK (County and State). The annual rental on this land is $ 1/3 (crop) $10 (pasture) and is paid to John Youngfarmer, 19____.

Endorsements and guaranties for others (amounts and maturities) ________

Have you any partners in your business? No If so, state particulars Share some equip. with Dad

Have you ever been adjudged a bankrupt? No If so, state particulars ________

Judgments or suits pending against me at this time $ 0.00 state particulars ________

Life insurance $ 50,000.00 payable to Pretty Youngfarmer. Is the right to change beneficiary reserved? Yes

Insurance on: Buildings $ 20,000.00 Grain $ 0 Livestock $ 0

Machinery and Automotive Equipment $ 30,000.00 Liability $ 50,000.00,

I have resided at present location 1 years 6 months. Formerly resided parents' home (John Youngfarmer)

I CERTIFY THAT THE STATEMENT ON THE REVERSE SIDE AND THE SCHEDULES AND INFORMATION ABOVE ARE CORRECT

DATED AT 1:30 p.m. *THIS* 2 *DAY OF* January *19*86

BEFORE SIGNING, SEE THAT ALL QUESTIONS HAVE BEEN ANSWERED AND ALL BLANKS FILLED.

Witness: ________ (Signed) Joe Youngfarmer

Pretty Youngfarmer

Age 22 yrs. ☒ Married ☐ Unmarried ☐ Separated

(Fill in only on application for secured credit, if required for compliance with loan or finance charge ceilings, or if applicant resides in a community property state.)

Subscribed and sworn to before me this ____ day of ________, 19____

(Notary Public in and for ________)

(SEAL)

My commission expires ________, 19____.

STATEMENTS SUBMITTED TO FEDERAL RESERVE BANK MUST EITHER BE SIGNED ORIGINALS OR CERTIFIED COPIES. IF COPIES ARE FUNISHED, FOLLOWING CERTIFICATE MUST BE OFFICIALLY SIGNED BY MEMBER BANK.

WE HEREBY CERTIFY THAT THE FOREGOING IS A TRUE AND CORRECT COPY OF A SIGNED FINANCIAL STATEMENT OF THE ABOVE-MENTIONED INDIVIDUAL, FIRM, OR CORPORATION NOW ON FILE IN THIS BANK, AND THAT, TO THE BEST OF OUR KNOWLEDGE AND BELIEF, THIS STATEMENT REFLECTS THE TRUE CONDITION OF THE BORROWER.

NAME OF MEMBER BANK ________

OFFICIAL SIGNATURE AND TITLE ________

STATEMENTS CERTIFIED BY PUBLIC ACCOUNTANTS MAY, IN THE DISCRETION OF THE DISCOUNT COMMITTEE OF THE FEDERAL RESERVE BANK, BE ACCEPTED.

OBTAIN AND USE CREDIT
UNIT II

TEST

NAME ______________________________ SCORE ______________

1. Match to their correct definitions terms associated with obtaining and using credit. Write the correct numbers in the blanks. Definitions continue on the next page.

_____a. Repayment of a loan with a regular series of payments over a specified period of time

_____b. Loans that provide a means by which interest rates may be lowered or raised, depending upon the cost of money in the markets

_____c. Total finance charge on a loan, based upon compound interest table and expressed as an annual interest rate

_____d. Interest rate charged by lender that covers cost of money plus a reasonable profit

_____e. Rate being charged by lender to best credit risk for short-term loans

_____f. Financial arrangement that provides funds to cover operating and capital expenses during a complete farming cycle, normally one year

_____g. Farm business's ability to compensate for variations in expenses and income as well as judgment errors in use of credit

_____h. Farm business's ability to meet long-run claims against the business

_____i. Farm business's capacity to generate sufficient cash to meet its financial obligations as they fall due

_____j. Use of borrowed funds to supplement equity capital

_____k. Unfavorable occurrence that can be assigned reasonably accurate odds on chances of its happening

1. Credit
2. Collateral
3. Uncertainty
4. Risk
5. Financial leverage
6. Liquidity
7. Solvency
8. Risk-bearing ability
9. Line of credit
10. Prime interest rate
11. Base rate
12. Annual percentage rate (APR)
13. Variable interest rate loans
14. Amortization
15. Fixed interest rate loans

TEST

______l. Occurrence that cannot be assigned accurate odds on chances of its happening

______m. Items pledged or mortgaged to secure a note

______n. Capacity to borrow money

______o. Loans that provide same rate of interest over the life of the loan

2. Discuss advantages and disadvantages of using credit.

Advantages

____

____

____

____

____

____

Disadvantages

____

____

____

____

____

____

3. Match types of credit to their correct definitions. Write the correct numbers in the blanks.

______a. Credit for personal use rather than for a use that will generate future income

______b. Credit that generally returns its original cost plus an amount for interest profit

1. Production credit
2. Consumption credit

TEST

4. Select from the following list guidelines for building and maintaining a good credit standing. Write an "X" in the blank before each correct answer.

_____a. Buy everything with cash

_____b. Get your credit from specialists

_____c. Establish a credit rating

_____d. Use only short-term credit

_____e. Plan ahead for credit needs

_____f. Plan the use of loan funds with your spouse

_____g. Borrow to make or save money

_____h. Work out a repayment plan for every loan

_____i. Meet your payments within at least ten days of their due dates

_____j. Accumulate debts in several places to distribute your credit

_____k. Take an annual inventory

5. List the three Cs of good credit.

a. ______________________________

b. ______________________________

c. ______________________________

6. State factors that a lender looks for in a borrower.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

TEST

7. Select from the following list factors that a borrower looks for in a lender. Write an "X" in the blank before each correct answer.

______a. Convenient location

______b. Good reputation

______c. Permanence and dependability

______d. Knowledge of agriculture

______e. High cost of credit

______f. Equitable policies

8. State three indicators of good loan-repayment ability.

a. ____

b. ____

c. ____

9. State five indicators of poor loan-repayment ability.

a. ____

b. ____

c. ____

d. ____

e. ____

10. Match to their correct definitions major types of credit extended by businesses. Write the correct numbers in the blanks. Definitions continue on the next page.

______a. Customer may buy in person, by mail, or by telephone; no down payment or interest is charged; statement is made and sent monthly; customer has stated period in which to repay with no interest charge

______b. Maximum amount is usually established; payments are made monthly, depending on terms of the business; interest is charged; new purchases can be added, up to established amount of maximum

1. Open-account credit
2. Revolving charge account
3. Optional revolving credit
4. Installment credit

TEST

_____c. Business sends monthly bills; entire bill can be paid within agreed number of days after billing without interest; if entire bill is not paid, customer makes a monthly payment and the unpaid balance is subject to a service charge and/or interest

_____d. Payments are made over a long period of time; interest is charged; service charge is sometimes added; consumer has option of repaying the entire amount at any time; if consumer does not maintain payments, merchandise may be repossessed

11. Match to their correct descriptions types of loans issued by banks and other lending institutions. Write the correct numbers in the blanks. Terms and descriptions continue on the next page.

_____a. Loan in which legal title to item purchased is held as security or collateral by lending institution

_____b. Loan based on cash value of a person's permanent insurance policy

_____c. Loan made with collateral—such as blue chip stock—that is safe and will not lose value

_____d. Loan given to a customer with a good credit record based simply on customer's promise to repay

_____e. Short-term loan (for less than one year) that is repaid in installments or in full at end of specified time period

_____f. Arrangement that allows a person to borrow the amount in her or his savings account without having to withdraw the savings

_____g. Loan to finance a post-secondary (after high school) education, with repayment usually deferred until after graduation

_____h. Money borrowed to pay all debts

_____i. Using a bank credit card—such as Visa or Mastercharge—to finance purchases or to borrow cash

1. Education loan
2. Passbook loan
3. Demand loan
4. Unsecured personal loan
5. Secured personal loan
6. Life-insurance loan
7. Collateral loan
8. Consolidated loan
9. Credit-card loan

TEST

______j. Bank loan automatically extended through borrower's checking account

______k. Special loan for the purpose of increasing the value of a home by adding a room, putting on a roof, and so on

______l. Loan made on real estate, with the property pledged as security for loan

______m. Mortgage loan insured by the Federal Housing Authority

______n. Mortgage loan for eligible veterans in which the Veteran's Administration partially guarantees the loan

______o. Collateral or mortgage loans for eligible farm families in which the Farmers Home Administration partially guarantees the loan or makes the loan

10. FmHA loan
11. FHA loan
12. Home-improvement loan
13. VA loan
14. Mortgage loan
15. Check-credit loan

12. List five sources of farm credit.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

13. State factors that determine the cost of credit.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

TEST

14. Match methods of computing interest to their correct definitions. Write the correct numbers in the blanks.

_____a. Interest calculated on original amount of loan for full period of loan; this amount, plus any other loan costs, is subtracted from amount of loan at beginning, with borrower receiving the difference

_____b. Interest based on original loan for entire period of loan; the sum of total interest and principal is divided by number of payments to obtain amount of each installment

_____c. Interest calculated by multiplying outstanding principal by contractual rate for period in question

_____d. Amount paid for borrowing money that is repaid in a single lump sum

1. Simple interest
2. Remaining balance
3. Add-on
4. Discount

15. Write the formula for calculating the true annual interest rate.

16. Match types of credit instruments to their correct descriptions. Write the correct numbers in the blanks. Instruments and descriptions continue on the next page.

_____a. Written form telling financial institution to pay a sum of money to person named on check

_____b. Written promise of the borrower to repay a certain sum of money to a certain person or bearer on demand or on a specified date

_____c. Order from one party to another directing that party to pay money to a third party

_____d. Legal assignment of property to a creditor as security for a debt—the assignment to be void upon completed payment of the debt

_____e. Written statement certifying that the ownership of something has been transferred by sale

1. Mortgage
2. Bill of sale
3. Draft
4. Check
5. Promissory note

TEST

______f. Document given by a warehouseman for goods received for storage; evidence that the person named in the receipt has deposited with the warehouseman products of a specified amount and quantity

______g. Form used to provide public information to the county clerk on the security for a loan

______h. Document that spells out the rights and duties of both parties to a loan and gives the lender a security interest in the borrower's personal property, which is described therein

______i. Written application for a loan that shows the lender how much money is wanted, for what purpose it is to be used, and how and when the borrower plans to pay it back

______j. Contract or receipt signed by a common carrier agreeing to deliver the described freight to a given person at a stated place

______k. Written agreement by one party to sell a property or a service to a second party for a stated price and under stated conditions

______l. Sheet showing financial condition at a definite time and listing all assets, values of assets, and liabilities of the farm or individual

______m. An estimate of amount and timing of all cash inflows and cash outflows that are expected to occur throughout the planning period (usually one year)

6. Financing statement
7. Warehouse receipt
8. Cash-flow projection
9. Loan application
10. Sales contract
11. Net-worth statement
12. Bill of lading
13. Security agreement

(NOTE: Test items 17 through 23 list the assignment sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

17. Determine personal credit standing.
18. Evaluate credit and loan situations.
19. Calculate interest expense.
20. Compare financing methods.
21. Determine when to borrow.
22. Complete an application for credit.
23. Complete an application for an agricultural loan.

OBTAIN AND USE CREDIT
UNIT II

ANSWERS TO TEST

1. a. 14
   b. 13
   c. 12
   d. 11
   e. 10
   f. 9
   g. 8
   h. 7
   i. 6
   j. 5
   k. 4
   l. 3
   m. 2
   n. 1
   o. 15

2. Discussion should include the following

   Advantages

   a. Is a convenience
   b. Aids in recordkeeping and budgeting
   c. Allows consumer to use goods while paying for them
   d. Is a type of forced savings
   e. Enables consumer to meet financial emergencies
   f. Allows consumer to take advantage of some bargains

   Disadvantages

   a. Weakens sales resistance
   b. Can cause serious financial problems when consumer gets deeply into debt
   c. Encourages impulse buying
   d. Costs consumer money
   e. Makes cost of goods and services higher
   f. Credit cards can be lost or stolen

3. a. 2
   b. 1

4. b, c, e, g, h, k

5. a. Character
   b. Capital
   c. Capacity

6. a. Good character
   b. Managerial ability
   c. Stable financial position
   d. Ability to repay
   e. Sound purpose for loan
   f. Adequate security for loan

ANSWERS TO TEST

7. b, c, d, f

8. Answer should include any three of the following

   a. Good managerial ability
   b. Sufficient repayment capacity
   c. Product price rise
   d. Increase in size of operation
   e. Additional income

9. Answer should include any five of the following

   a. Low production per unit
   b. Low price per unit sold
   c. High cash production costs
   d. High cash overhead costs
   e. High cash living costs
   f. Borrowing above the ability to repay
   g. Overestimating amount of loan that can be repaid each year

10. a. 1
    b. 2
    c. 3
    d. 4

11. a. 7
    b. 6
    c. 5
    d. 4
    e. 3
    f. 2
    g. 1
    h. 8
    i. 9
    j. 15
    k. 12
    l. 14
    m. 11
    n. 13
    o. 10

12. Answer should include any five of the following

    a. Commercial banks
    b. Individuals
    c. Merchants or dealers
    d. Finance companies
    e. Insurance companies
    f. Federal Land Bank Associations
    g. Production Credit Associations
    h. Farmers Home Administration
    i. Oklahoma Commissioners of the Land Office

ANSWERS TO TEST

13. a. Purpose and type of loan
    b. Economic conditions
    c. Individual's credit rating
    d. Service cost of loan

14. a. 4
    b. 3
    c. 2
    d. 1

15. $$\frac{\text{Total of Finance Charges}}{\text{1/2 of Original Loan}} \times \frac{\text{Number of Payments}}{\text{Number of Years}} \times \frac{1}{\text{Number of Payments Plus 1}} = \text{True Annual Interest Rate}$$

16. a. 4
    b. 5
    c. 3
    d. 1
    e. 2
    f. 7
    g. 6
    h. 13
    i. 9
    j. 12
    k. 10
    l. 11
    m. 8

17. Evaluated to the satisfaction of the instructor

18. Evaluated to the satisfaction of the instructor

19. Evaluated to the satisfaction of the instructor

20. Evaluated to the satisfaction of the instructor

21. Evaluated to the satisfaction of the instructor

22. Evaluated to the satisfaction of the instructor

23. Evaluated to the satisfaction of the instructor

ANALYZE THE CROP INDUSTRY
UNIT I

UNIT OBJECTIVE

After completing this unit, the student should be able to interpret general trends, price changes, and crop reports for crops grown in Oklahoma. The student will show this ability by completing the assignment sheets and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with the crop industry.
2. Arrange in order phases of agricultural industry.
3. State factors to consider in deciding which crops to grow.
4. Identify national farm production regions.
5. Name major crops grown in Oklahoma.
6. State reasons for using crop reports.
7. Label a pie chart showing the value of production of major crops grown in Oklahoma.
8. Match to their correct descriptions occupational areas related to the crop industry.
9. Interpret general trends of the crop industry.
10. Interpret price changes in the crop industry.
11. Interpret USDA supply and disappearance estimates.
12. Gather information about a crop industry occupation.

ANALYZE THE CROP INDUSTRY
UNIT I

SUGGESTED ACTIVITIES

I. Unit contents

  A. Objective sheet

  B. Suggested activities

    1. Supplements

      a. Supplement #1 — Crop Industry Word Search

      b. Supplement #2 — Agricultural Industry Phases

      c. Supplement #3 — Farm Production Regions

    2. Transparency masters

      a. TM #1 — White Pan Bread—1-Pound Loaf

      b. TM #2 — Farm-Production Regions

      c. TM #3 — Top 10 Oklahoma Counties in Wheat Production, 1984

      d. TM #4 — Top 10 Oklahoma Counties in All Hay Production, 1984

      e. TM #5 — Top 10 Oklahoma Counties in Peanut Production, 1984

      f. TM #6 — Top 10 Oklahoma Counties in Cotton Production, 1984

      g. TM #7 — Top 10 Oklahoma Counties in Grain Sorghum Production, 1984

      h. TM #8 — Top 10 Oklahoma Counties in Soybean Production, 1984

      i. TM #9 — Top 10 Oklahoma Counties in Corn-for-Grain Production, 1984

      j. TM #10 — Top 10 Oklahoma Counties in Oats Production, 1984

      k. TM #11 — Top 10 Oklahoma Counties in Barley Production, 1984

  C. Information sheet

  D. Assignment sheets

    1. Assignment Sheet #1 — Interpret General Trends of the Crop Industry

    2. Assignment Sheet #2 — Interpret Price Changes in the Crop Industry

SUGGESTED ACTIVITIES

3. Assignment Sheet #3 — Interpret USDA Supply and Disappearance Estimates

4. Assignment Sheet #4 — Gather Information About a Crop Industry Occupation

E. Answers to assignment sheets

F. Test

G. Answers to test

II. Instructor's guide

A. Review unit and plan presentation.

B. Order or obtain materials to supplement unit.

1. Books

a. Most current edition of *Oklahoma Agricultural Statistics*; available from Oklahoma Crop and Livestock Reporting Service, Oklahoma Department of Agriculture, P.O. Box 1095, Oklahoma City, Oklahoma 73101.

b. Most current edition of *United States Department of Agriculture Agricultural Statistics*; for sale from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

2. Reports

(NOTE: The Oklahoma Crop and Livestock Reporting Service publishes official estimates of crop and livestock production, prices received and paid by farmers, and various other special reports. The reports containing such data and the approximate date of release are listed as *a* and *b* below. These reports are free to producers and to anyone who submits reports to the Crop and Livestock Reporting Service. Others need to subscribe by submitting a subscription form and fee. Obtain free subscriptions and/or subscription forms from the Oklahoma Crop and Livestock Reporting Service, P.O. Box 1095, Oklahoma City, Oklahoma 73101.)

a. *Oklahoma Crop-Weather Summary*, issued weekly March through November; contains weekly summary on progress, status, or happenings related to crops, livestock, and weather.

b. *Oklahoma Farm Statistics*, issued about twice a month; contains varied contents which include Oklahoma and U.S. crop acreages, yield and production, grain stocks, livestock inventories and production, slaughter, wool, milk, poultry, farm numbers, income, farm employment, agricultural prices, and miscellaneous reports.

SUGGESTED ACTIVITIES

c. *Oklahoma Market Report*, issued weekly; contains crop and livestock cash market reports from markets across the state, comments on various commodities, and daily cash market prices; available from Market News Reporter, State Department of Agriculture, 2800 N. Lincoln Boulevard, Oklahoma City, Oklahoma 73105.

(NOTE: The United States Department of Agriculture publishes several outlook and situation reports and other useful periodicals. There is a subscription fee for these reports. Reports *d* and *e* below are for sale from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.)

d. *Outlook and Situation Reports*, most published four times a year; include agricultural exports, cotton and wool, dairy, feed, fruit, inputs, livestock and poultry, oil crops, rice, sugar and sweetener, tobacco, vegetable, wheat, world agriculture, and world agriculture regionals.

e. Current edition of *Handbook of Agricultural Charts*, a two-color handbook containing economic and agricultural trends and charts that illustrate data and trends for agricultural subjects ranging from farm income to consumer costs and from commodities to energy production and use.

3. Transparencies

4. Competency profiles

(NOTE: Transparencies and competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Provide students with unit.

D. Introduce unit.

SUGGESTIONS:

- Point out that where a person lives in this world has something to do with the amount of food that is available to that person and to that person's family. Emphasize to the student how fortunate he or she is to live in the United States: The United States is a heavy producer of food products, and the United States is not as heavily populated as some of the other parts of the world.
- Discuss unit and specific objectives, explaining that the major thrusts of this unit are to increase the student's awareness of the crop industry and to discuss the major crops grown in Oklahoma and the economic effects of this production.

SUGGESTED ACTIVITIES

E. Discuss information and assignment sheets.

1. Use Information Sheet, Section I to introduce terms associated with the crop industry.

   SUGGESTIONS:

   - Point out the importance of defining terms for common understanding.
   - Use Supplement #1 to review terms.

2. Use Information Sheet, Section II to discuss the sequence of phases of agricultural industry.

   SUGGESTIONS:

   - Have students identify different groups or organizations that affect different phases of the agricultural industry.
   - Use Supplement #2 and Transparency #1 to illustrate the phases wheat goes through to become a loaf of bread.

3. Use Information Sheet, Section III to discuss factors to consider in deciding which crops to grow.

   SUGGESTION:

   - Point out that crop production is primarily dependent upon favorable weather. In order to grow, plants must have proper amounts of sunlight and adequate water, either from rainfall or from irrigation. Acceptable temperature ranges must be maintained, too, and wind must blow to circulate carbon-dioxide among the leaves and to carry away the oxygen that plants respire. Each crop has a certain combination of weather conditions under which it grows best and produces most.

4. Use Information Sheet, Section IV to discuss national farm production regions.

   SUGGESTIONS:

   - Ask students if they have ever wondered why most of the oranges produced in the United States come from California and Florida? Why farmers in the western United States produce corn only under irrigation? Why the Corn Belt is so important in feeding and finishing hogs and cattle? Why cotton, peanuts, and sweet potatoes are so important in the South? Why wheat is the principal crop of the Northern and Southern Plains? Why we have a Corn Belt?

SUGGESTED ACTIVITIES

- Point out that to answer these questions and many others we must study the various physical conditions prevailing in the different parts of the United States. It is of value in gaining an understanding of agriculture to examine the reasons why certain areas are important for one group of crops, while in other areas a different group of crops predominates.

- Use Transparency #2 and Supplement #3 when discussing the farm production regions.

5. Use Information Sheet, Section V to discuss major crops grown in Oklahoma.

SUGGESTIONS:

- Point out that agriculture is the second leading industry in Oklahoma.

- Use Transparencies #3 through #11 to illustrate the top ten Oklahoma counties in major crop production.

- Have students discuss reasons why certain crops are grown in some counties, while in other counties a different crop predominates.

- Have students brainstorm about crops grown in the local area. Write the crops on the chalkboard and compare with the major crops grown in Oklahoma.

- Discuss the leading states in each crop area and the farm production regions they represent. Point out Oklahoma's United States ranking in each crop area. Also point out that production changes from year to year. For instance, Oklahoma ranked second in 1982 in winter wheat production but ranked fourth in 1983. One of the reasons for the decreased production was Oklahoma farmers' participation in the USDA Payment In Kind (PIK) program which paid them for not harvesting grain from certain acres.

6. Use Information Sheet, Section VI to discuss reasons for using crop reports.

SUGGESTIONS:

- Have students read copies of various USDA and State Department of Agriculture crop reports; discuss how these reports would be useful to a farmer.

- Have a progressive farmer from your community speak to students about how he or she uses crop reports and other sources of outlook information to make decisions.

SUGGESTED ACTIVITIES

- Point out that the crop reports are a reflection of market conditions at a particular point in time. As actions of farmers and consumers change, so do crop report statistics. Emphasize that outlook information is not perfect and probably never will be. But less-than-perfect information may be far superior to none.

7. Use Information Sheet, Section VII and Assignment Sheets #1 through #3 to discuss statistics for major crops grown in Oklahoma.

   SUGGESTIONS:

   - Use Assignment Sheet #1 to illustrate general trends in harvested acres and total production of winter wheat. Update the assignment sheet to reflect the most current information possible. Provide sources for the students to complete Part II of the assignment sheet.

     (NOTE: Data for Assignment Sheets #1 through #3 were secured from *Oklahoma Agricultural Statistics, 1984* and *USDA Agricultural Statistics, 1983*.)

   - Use Assignment Sheet #2 to illustrate price changes. Students may need some help plotting monthly prices received. Update the assignment sheet to reflect the most current information available. Provide sources for the students to complete Part II of the assignment sheet.

   - Use Assignment Sheet #3 to illustrate USDA supply and disappearance estimates. You might want to explain the concept of supply and demand and how this affects the price offered to farmers. Use the most current information possible to discuss present crop situations. Discuss the impact of USDA crop reports on the marketplace.

   - Discuss the value of production of major crops grown in Oklahoma. Point out that value of production is based on total production times the season's average price for that crop. Emphasize that total dollars will change from year to year, but the percentage of total crop production will not change very much from year to year.

8. Use Information Sheet, Section VIII and Assignment Sheet #4 to discuss occupational areas related to the crop industry.

   SUGGESTIONS:

   - Have students interview someone who has an occupation *related* to the crop industry.

   - Invite a person who works in the crop industry to speak to the class.

   - Have students complete Assignment Sheet #4.

SUGGESTED ACTIVITIES

F. Give test.

G. Critique test and discuss in class.

H. Reteach and retest if necessary.

I. Complete appropriate section of competency profiles.

III. A. *Agricultural Prices, 1983 Summary*. Washington, D.C.: United States Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, June 29, 1984.

B. *Agricultural Statistics, 1983*. Washington, D.C.: United States Department of Agriculture/United States Government Printing Office, 1983.

C. Boone, Lester V., Chester A. Richer, and Harold K. Wilson. *Producing Farm Crops*. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1981.

D. Hoover, Norman K. *Handbook of Agricultural Occupations*, 4th ed. Danville, Illinois: The Interstate Printers & Publishers, Inc., 1985.

E. *1981 Yearbook of Agriculture*, "Will There Be Enough Food?" Washington, D.C.: United States Department of Agriculture, 1981.

F. *Oklahoma Agricultural Statistics, 1984*. Oklahoma City, Oklahoma: Oklahoma Department of Agriculture/Oklahoma Crop and Livestock Reporting Service, 1984.

G. *Oklahoma Agriculture 2000*. Stillwater, Oklahoma: Oklahoma State University/Division of Agriculture, 1982.

H. *Wheat Outlook and Situation Report*. Washington, D.C.: United States Department of Agriculture, Economic Research Service, WS-268, June, 1984.

SUGGESTED ACTIVITIES

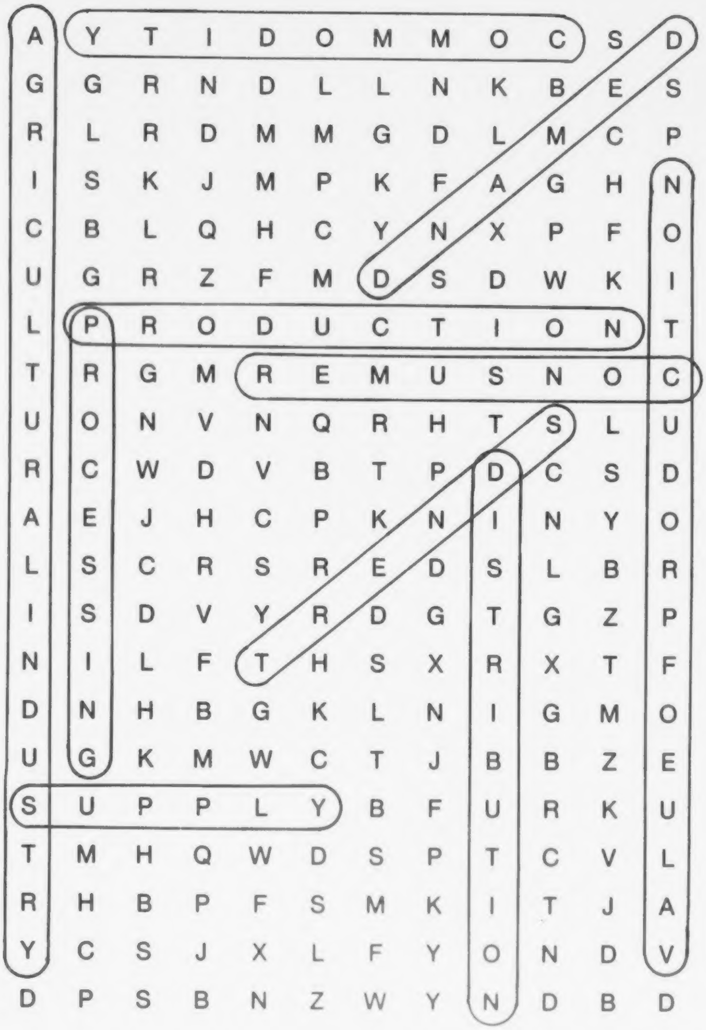
SUPPLEMENT #1 — CROP INDUSTRY WORD SEARCH

Find and circle the following crop industry words hidden in the puzzle below. Words may be forward, backward, up, down, or diagonal. A score of six is good, eight is excellent, and ten (100 percent) is super.

AGRICULTURAL INDUSTRY
COMMODITY
CONSUMER
DISTRIBUTION
PROCESSING
VALUE OF PRODUCTION
PRODUCTION
SUPPLY
DEMAND
TRENDS

A	Y	T	I	D	O	M	M	O	C	S	D
G	G	R	N	D	L	L	N	K	B	E	S
R	L	R	D	M	M	G	D	L	M	C	P
I	S	K	J	M	P	K	F	A	G	H	N
C	B	L	Q	H	C	Y	N	X	P	F	O
U	G	R	Z	F	M	D	S	D	W	K	I
L	P	R	O	D	U	C	T	I	O	N	T
T	R	G	M	R	E	M	U	S	N	O	C
U	O	N	V	N	Q	R	H	T	S	L	U
R	C	W	D	V	B	T	P	D	C	S	D
A	E	J	H	C	P	K	N	I	N	Y	O
L	S	C	R	S	R	E	D	S	L	B	R
I	S	D	V	Y	R	D	G	T	G	Z	P
N	I	L	F	T	H	S	X	R	X	T	F
D	N	H	B	G	K	L	N	I	G	M	O
U	G	K	M	W	C	T	J	B	B	Z	E
S	U	P	P	L	Y	B	F	U	R	K	U
T	M	H	Q	W	D	S	P	T	C	V	L
R	H	B	P	F	S	M	K	I	T	J	A
Y	C	S	J	X	L	F	Y	O	N	D	V
D	P	S	B	N	Z	W	Y	N	D	B	D

SOLUTION TO SUPPLEMENT #1



A	Y	T	I	D	O	M	M	O	C	S	D
G	G	R	N	D	L	L	N	K	B	E	S
R	L	R	D	M	M	G	D	L	M	C	P
I	S	K	J	M	P	K	F	A	G	H	N
C	B	L	Q	H	C	Y	N	X	P	F	O
U	G	R	Z	F	M	D	S	D	W	K	I
L	P	R	O	D	U	C	T	I	O	N	T
T	R	G	M	R	E	M	U	S	N	O	C
U	O	N	V	N	Q	R	H	T	S	L	U
R	C	W	D	V	B	T	P	D	C	S	D
A	E	J	H	C	P	K	N	I	N	Y	O
L	S	C	R	S	R	E	D	S	L	B	R
I	S	D	V	Y	R	D	G	T	G	Z	P
N	I	L	F	T	H	S	X	R	X	T	F
D	N	H	B	G	K	L	N	I	G	M	O
U	G	K	M	W	C	T	J	B	B	Z	E
S	U	P	P	L	Y	B	F	U	R	K	U
T	M	H	Q	W	D	S	P	T	C	V	L
R	H	B	P	F	S	M	K	I	T	J	A
Y	C	S	J	X	L	F	Y	O	N	D	V
D	P	S	B	N	Z	W	Y	N	D	B	D

SUGGESTED ACTIVITIES

SUPPLEMENT #2 — AGRICULTURAL INDUSTRY PHASES

WHITE PAN BREAD—1-POUND LOAF
(Estimated price and marketing spreads of ingredients — 1983)

Phase of agricultural industry		**Value per loaf (¢)**	**Percent of total (%)**
Production (4.94¢ or 9.09%)	Wheat (@ $3.47/bu)	4.08	7.51
	Other farm ingredients*	.86	1.58
Processing (4.71¢ or 8.67%)	Wheat from farm to flour mill	1.00	1.84
	Flour milling	1.25	2.30
	Flour from flour mill to baker	.52	.96
	Other farm ingredients**	.89	1.64
	Nonfarm ingredients***	1.05	1.93
Distribution (36.66¢ or 67.48%)	Baking**** (difference between wholesale price and cost of bread ingredients, f.o.b. bakery)	36.66	67.48
Consumption (8.02¢ or 14.76%)	Wholesale to retail price spread (difference between retail and wholesale price of bread)	8.02	14.76
	RETAIL PRICE OF BREAD	54.33¢	100.00%

* Other farm ingredients: lard, soybean oil, HFCS, corn syrup, and soy whey blend

** Includes processing, transportation, and merchandising

*** Nonfarm ingredients: yeast, yeast food, salt, other

**** Baking is part of both processing and distribution

SOURCE: *Wheat Outlook and Situation Report*, USDA/ERS, WS-268, June, 1984.

SUGGESTED ACTIVITIES

SUPPLEMENT #3 — FARM PRODUCTION REGIONS

NORTHEAST

Truck farms extend in a narrow belt along the entire Atlantic Coast. This region contains many factories and seaports, which give employment to great numbers of people. This region is densely populated and agricultural land is relatively limited. Farms are usually small and the soil is not especially productive, though it is well watered. The principal products are vegetables and fruits, which find a ready market in the nearby urban centers. The land, well suited to these truck crops, is intensively tilled. Large quantities of fertilizer are used annually to stimulate rapid growth and high yield.

Dairying is a major enterprise in New York, a large part of Pennsylvania, and in those sections of the Northeast states not occupied by forests or used for intensive truck and fruit crops.

LAKE STATES

LAKE STATES

Wisconsin and Minnesota lead in dairy production, with northern Illinois and northeastern Iowa contributing substantial quantities of whole milk to the Chicago market. The northerly latitude gives this area moderate to cool summer temperatures and a cold to severely cold winter season. Precipitation ranges from 25 inches or more in Minnesota to 50 inches in the easterly states. This precipitation is well distributed throughout the growing season, though at times there is a shortage of moisture in some areas during the late summer months. Heavy snowfall is not uncommon in the winter months. The frost-free season ranges from 90 to 150 days.

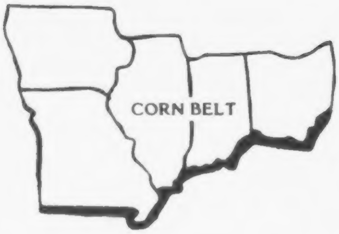
Much of the land of this area is rolling to rough and mountainous. A large percentage of it is nontillable and must be kept in forest land or permanently seeded to hay and pasture crops. The abundant rainfall and the cool temperatures are favorable for the growth of grass and forage crops. Smooth brome grass, orchard grass, timothy and Kentucky bluegrass in combination with alfalfa, sweet clover, alsike clover, ladino clover, and other legumes and grasses yield hay and pastures of excellent quality.

SUPPLEMENT #3

Some of the important crops of this region are oats, barley, rye, wheat, potatoes, beans, sugar beets, and fruit. Although corn and soybeans are grown to some extent, they are not as important as they are in the Corn Belt.

CORN BELT

The Corn Belt begins in eastern Ohio and stretches westward to Kansas at the southwest and to South Dakota at the northwest. It lies between the Appalachian region on the south and the Lake States region on the north. It covers Ohio, Indiana, Illinois, Iowa, Missouri, and the eastern half of Nebraska. It extends northwestward to include southeastern South Dakota and southern Minnesota and Wisconsin. The development of early-maturing varieties of corn and improved cultural practices is steadily pushing the Corn Belt northward and westward into the spring-wheat areas. Accompanying this movement has been a steady increase in cattle and hog production, which furnish the chief outlets for the corn crop.



A large part of the most productive farm land of the United States lies in this area. The soil is fertile and the topography is generally level and well suited to the use of farm machinery. Because it is nearly level, erosion is not as serious a menace as in some sections, although much of the land is used in the production of corn, soybeans, and other row crops. It is without doubt the most favored agricultural region in the United States in respect to soil and climate. Probably no other area in the world possesses physical conditions so favorable for the production of corn.

The annual precipitation of the area ranges from 40 inches in the easterly and southerly portions to 25 inches in the more westerly and northerly parts. Fortunately, the greater part of the precipitation, 60 to 80 percent, is in the form of rainfall during the spring and summer months. The length of the growing season ranges from 120 days in the more northerly parts to 180 days in the southerly and easterly sections.

The heaviest concentration in corn production centers in Iowa and Illinois, which are regarded as the center of the Corn Belt. These two states alone produce well over one-third of the total corn market, by far the larger part is fed to livestock, which is heavily concentrated

SUPPLEMENT #3

throughout the Corn Belt. Hogs and beef cattle consume more than 50 percent of the corn crop in the United States and are invariably found in large numbers wherever corn is grown. The meat packinghouse markets in Kansas City, Omaha, South St. Paul, St. Louis, Waterloo, Ottumwa and other cities are outgrowths of the corn and livestock production of the Corn Belt.

Other important crops of the area are soybeans, wheat, oats, barley and tame hay, which includes alfalfa, alsike and red clover, timothy and other grasses. Soybeans have become the leading "cash" crop.

NORTHERN PLAINS

This region includes the Red River Valley of Minnesota, North and South Dakota, Nebraska, and Kansas. In the northern part of the region, winter temperatures are too low to permit the production of most fall-seeded varieties, though other conditions are favorable for them. The hard, red spring wheat produced in this region is world-renowned for its high content of strong gluten and its excellent milling quality. The flour from this grade of wheat is highly esteemed for making white bread. The great flour mills at Minneapolis and Duluth are built upon the reputation of hard spring wheat grown in the area. Soil and climate combine here to produce this exceptional quality of wheat.

NORTHERN
PLAINS

The soil, reclaimed largely from the tall-grass prairies, but extending into the short-grass area in places, is a glaciated clay loam, black to brown in color, overlying a retentive subsoil that is rich in calcium. Precipitation is relatively low, ranging from 25 inches in the eastern border to as little as 15 inches at the western. About 80 percent of the precipitation is normally in the form of early summer rains. It is possible, therefore, to grow good crops in spite of a low total rainfall. It is necessary to employ moisture-conserving practices, however, in the western areas to ensure satisfactory yields. The frost-free season ranges from 100 to 150 days.

The western two-thirds of Kansas and a small part of Nebraska are known for their production of hard winter wheat. Differences in soil formation and precipitation distinguish this area from the northern states in the region.

SUPPLEMENT #3

Other crops of importance grown in this region are corn, soybeans, oats, barley, rye, flax, sugar beets, potatoes, sweet clover, and alfalfa. Sheep, hogs, and range and stocker cattle are sufficiently numerous to give variety to the agriculture of the region.

APPALACHIAN

This region has a relatively high rainfall, ranging from 35 to 50 inches. Most of the area receives more than 40 inches annually. It is a region of relatively mild winters and an average growing season of 180 days. Since the Ohio River Valley traverses the area, the topography is rolling to rough, particularly at the eastern end. As a result of heavy precipitation and the long open season, soil erosion is a constant menace, particularly where row crops are grown. The soil, however, is productive where it has been conserved and properly managed.

APPALACHIAN

Corn and winter wheat are the most important products grown. The corn is of good quality. Wheat is fall-sown and generally of the soft, red winter class, which is used largely for hot breads and pastry cooking. Soybeans have become one of the most important cash crops. Tobacco is also an important product of the area, with Kentucky being the principal center for the commercial crop, though Virginia, Pennsylvania, Tennessee, Ohio, and Maryland grow considerable quantities. Forage crops are abundant and good grass pastures are much more prevalent than in the Delta States to the south. Kentucky grows excellent Kentucky bluegrass, a leading pasture and lawn grass throughout the northern states. Because of the large area of forage and pasture crops, crop production for livestock is of less importance in this region.

SOUTHEAST

Subtropical fruits, such as oranges, lemons, grapefruit, pears of the tender varieties, and many of the small bush and vine fruits are grown in this area. Rice, peanuts, sugar cane, and forage crops are also successfully produced. Rainfall varies from 40 to 60 inches. Temperatures are high. There is a growing season of 240 days or more. The altitude is little above sea level, and the predominately sandy soil is usually low in natural fertility. Large quantities of fertilizers are required to secure satisfactory production.

SUPPLEMENT #3

Northern Alabama, Georgia, and South Carolina are favored with a relatively fertile soil. This area is especially noted for its production of cotton, peanuts, and soybeans.

DELTA STATES

DELTA
STATES

Cotton is the primary crop produced in the Delta States region. Rainfall in this region ranges from 60 inches to as little as 30 inches. The growing season ranges from 200 to 240 days, which is near the lower limit for maturing a cotton crop. The area is favored with a relatively fertile soil, though much of it is subject to erosion and leaching from heavy rainfall. It is regarded as one of the most favored cotton-producing sections in the world. The cotton crop from this region has been one of the chief export commodities of the United States. It has, at the same time, furnished the raw material for the great cotton-goods factories of New England and the southern states.

While cotton is the chief and most important crop in this region, there are many other products. Among them are soybeans, rice, sugar cane, sorghum, peanuts, cowpeas, velvet beans, and tobacco. Corn is becoming a more important crop in some sections, especially where irrigation is practiced on sandy soils.

SOUTHERN PLAINS

SOUTHERN
PLAINS

Differences in precipitation and in soil formation distinguish this area from the Corn Belt and Northern Plains regions. The rainfall varies from 35 inches at the eastern border to as little as 15 inches at the western. The growing season ranges 150 to 180 days. The soils are alkaline and underlaid with limestone and shale. The topography, for the most part, is level to slightly rolling and the land is easily tilled. Farms are large and large machinery is used almost exclusively. This provides for lower production costs per acre. There are extensive areas for grazing in west Texas.

Eastern Oklahoma and Texas have more productivity than the western part. With the higher rainfall, winter wheat, soybeans, and cotton are grown. Several areas with sandy soils raise peanuts. Cotton is also raised in the Texas panhandle and in southwest Oklahoma. Hard winter wheat is raised in northwestern Oklahoma and the Texas panhandle.

Subtropical fruits are grown in the Rio Grande Valley of south Texas.

SUPPLEMENT #3

MOUNTAIN

This is a large region of great and varied resources but of minor importance in agricultural production. it extends from the east side of the Rocky Mountains to the east side of the Coast ranges and from northern Montana to the Mexican border. It is of rough topography, varying in elevation from great mountain peaks to deep valleys. Short mountain ranges parallel the Rocky and Coast ranges. Forest trees cover most of the mountain ranges and some of the better-watered valleys. The plains are covered with bunch grasses, sagebrush, and other desert vegetation. Precipitation is scant, varying from 20 inches in some of the mountain areas to less than 10 inches on the intervening plateaus. As a result of variations in altitude and latitude, temperatures vary greatly. The growing season ranges from 90 days, or less, to as much as 150 days in southern latitudes.

The chief agricultural activity is the production of range livestock. Cattle, sheep, horses and goats are grazed extensively on the native grasses and other vegetation.

Much of the grazing land is in the public domain or in national forests. Much of it is under the control of the United States Forest Service, which leases grazing rights to ranchers or other livestock producers. Much of the grazing land has been injured by overgrazing, drouth, and wind erosion. As a consequence, 20 to 40 acres are often required to provide feed for a mature cow or her equivalent in other livestock. These lands, under the guidance of the Forest Service, however, are gradually being brought back into good condition. Under good management, they should be kept permanently as grazing lands. Large areas might well be converted into forests.

While most of the area is best used for livestock production, there are many valleys adapted to irrigation, which yield heavily of grains, fruits, and vegetables. Much of the land that has little use for agriculture or grazing contains mineral resources of great value.

A considerable area of land in northwestern Montana, northern Idaho, and northeastern Washington is naturally adapted to the growth of forest trees and hay crops, particularly alfalfa. As the land is cleared and improved, grains, vegetables, potatoes, and sugar beets become important. Tame hay production and grazing are, however, the forms of agriculture to which this area is best adapted at present.

SUPPLEMENT #3

PACIFIC

This region consists of the states of Washington, Oregon, and California. It is a section of mild temperatures and heavy winter rainfall. The Japanese current along the coast tempers the climate both winter and summer. The winters are mild and the summers cool. The rainfall ranges from 100 inches at the north on the coast to 40 or less at the southern end. Topography varies from rough and mountainous to broad level valleys, with temperatures influenced by altitude.

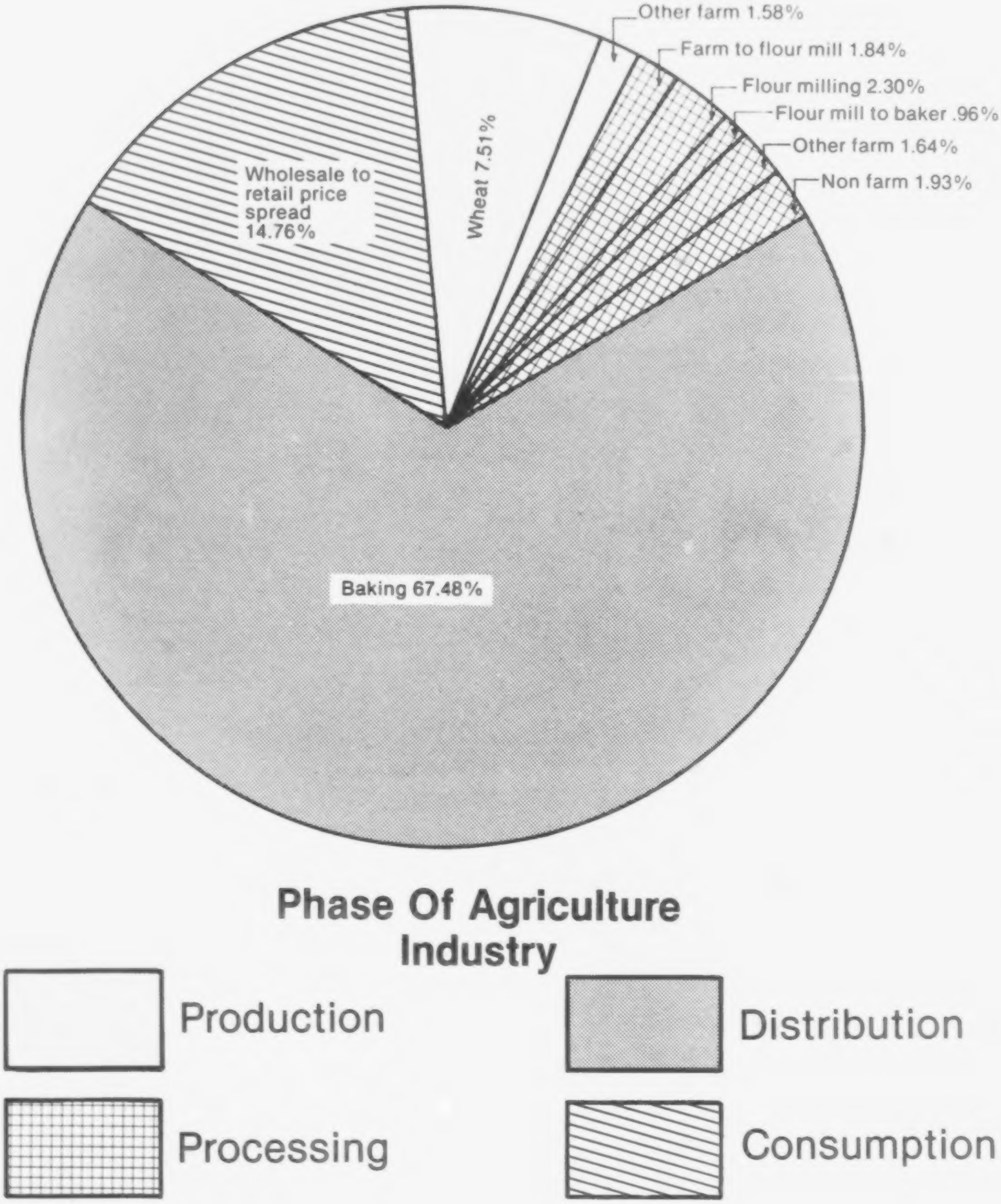
The northern part of this area was originally densely forested. Much of it still is forested and should remain so. The cool climate and heavy rainfall favor the production of grass and hay crops. Dairying and the raising of beef cattle are important in parts. Although this is not looked upon as a grain-raising area, large acreages of barley, wheat, oats, flax, rice, and rye are produced in the broad valleys suited to these crops.

The southern two-thirds of California is a region of scant rainfall, varying from 10 inches at the extreme southern end to 20 inches or a little more at the northern end. Little agricultural production is attempted unless water for irrigating the land is available. Where it is available and wisely used, crop production is high. Subtropical fruits and vegetables are the principal products.

There is a small but highly fertile area in southeastern Washington, stretching into northern Oregon and parts of Idaho. It is an area of scant precipitation, 15 to 20 inches, but this limited precipitation comes at a time favorable for the production of wheat. The winter temperatures are low, and both winter and spring varieties are raised. The soil is rich and yields of wheat are notably high.

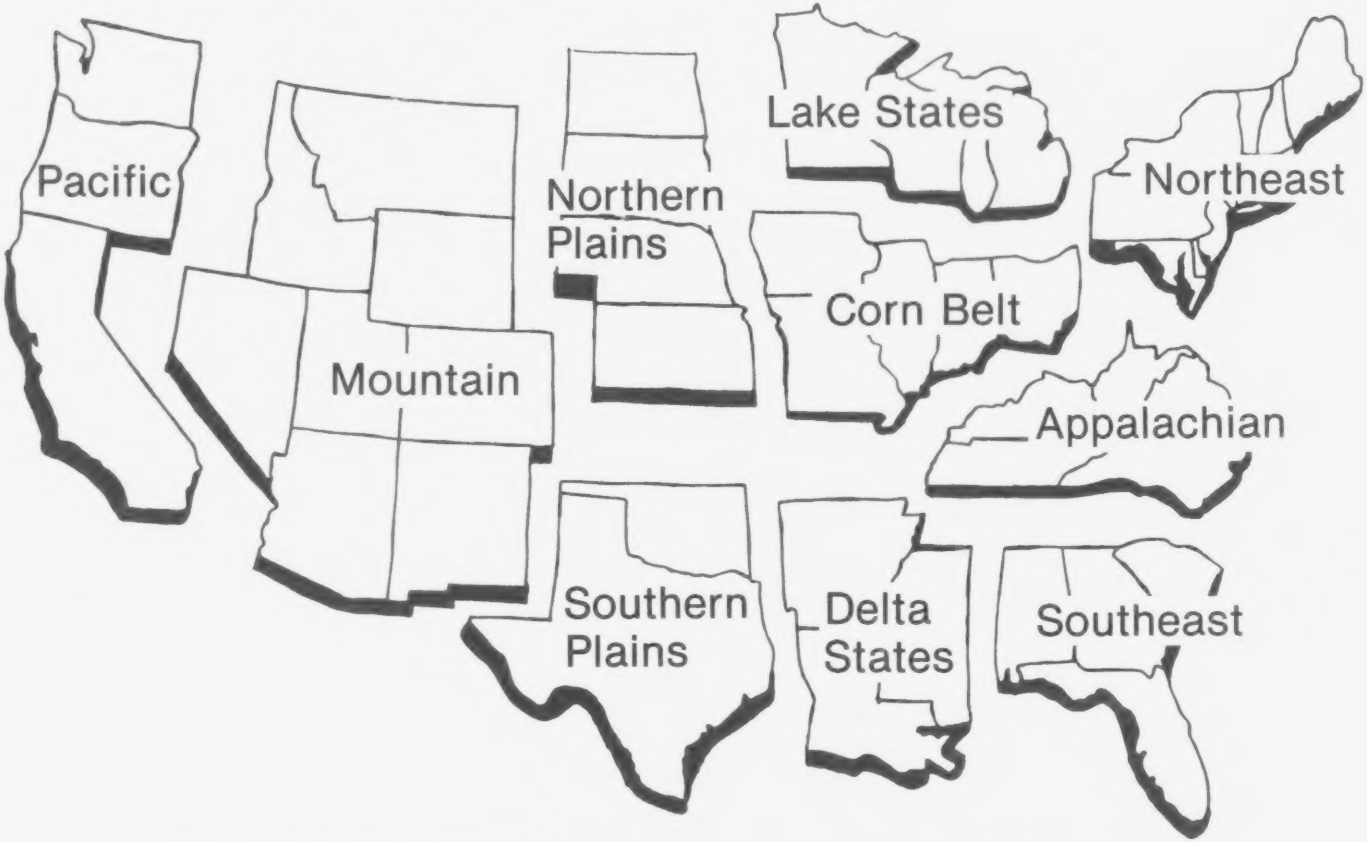
White Pan Bread — 1-Pound Loaf

VALUE PER LOAF (%)



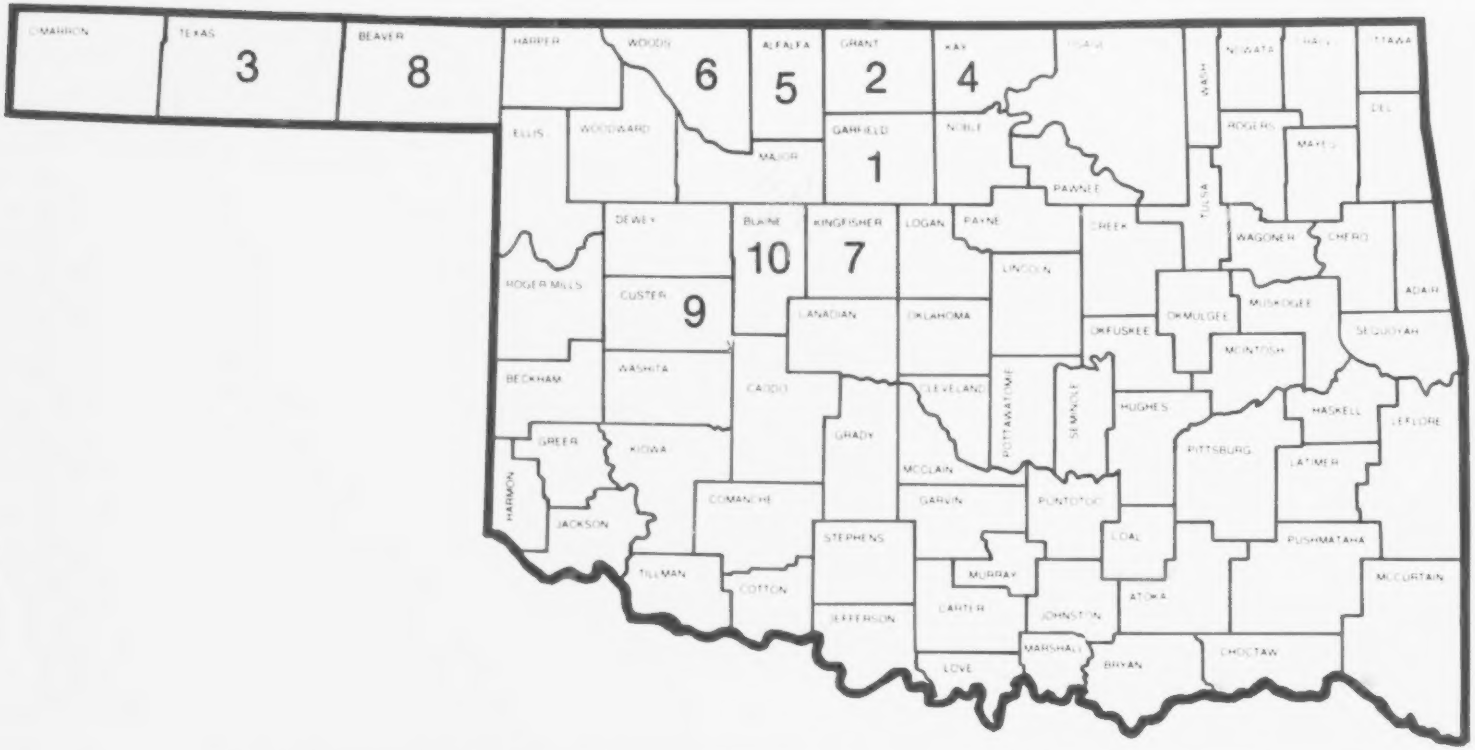
Source of information for pie chart: *Wheat Outlook and Situation Report*, USDA/ERS, WS-268, June, 1984.

Farm Production Regions


Pacific
Mountain
Northern Plains
Lake States
Corn Belt
Northeast
Appalachian
Southern Plains
Delta States
Southeast

Source: *Agricultural Prices, 1983 Summary*, United States Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, June 29, 1984.

Top 10 Oklahoma Counties in Wheat Production, 1984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CARTER
JOHNSTON
MARSHALL
LOVE
BRYAN
CHOCTAW

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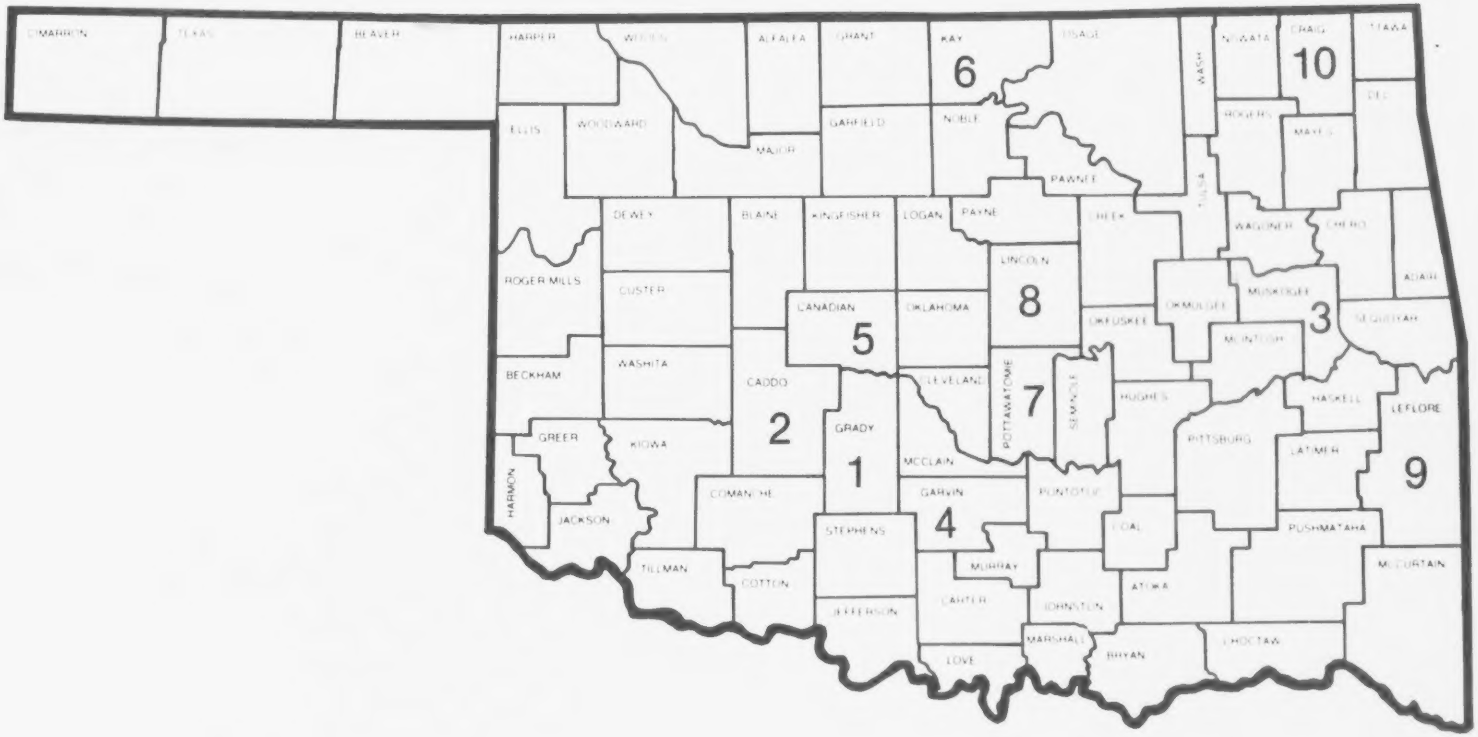
Top 10 Oklahoma Counties in All Hay Production, 1984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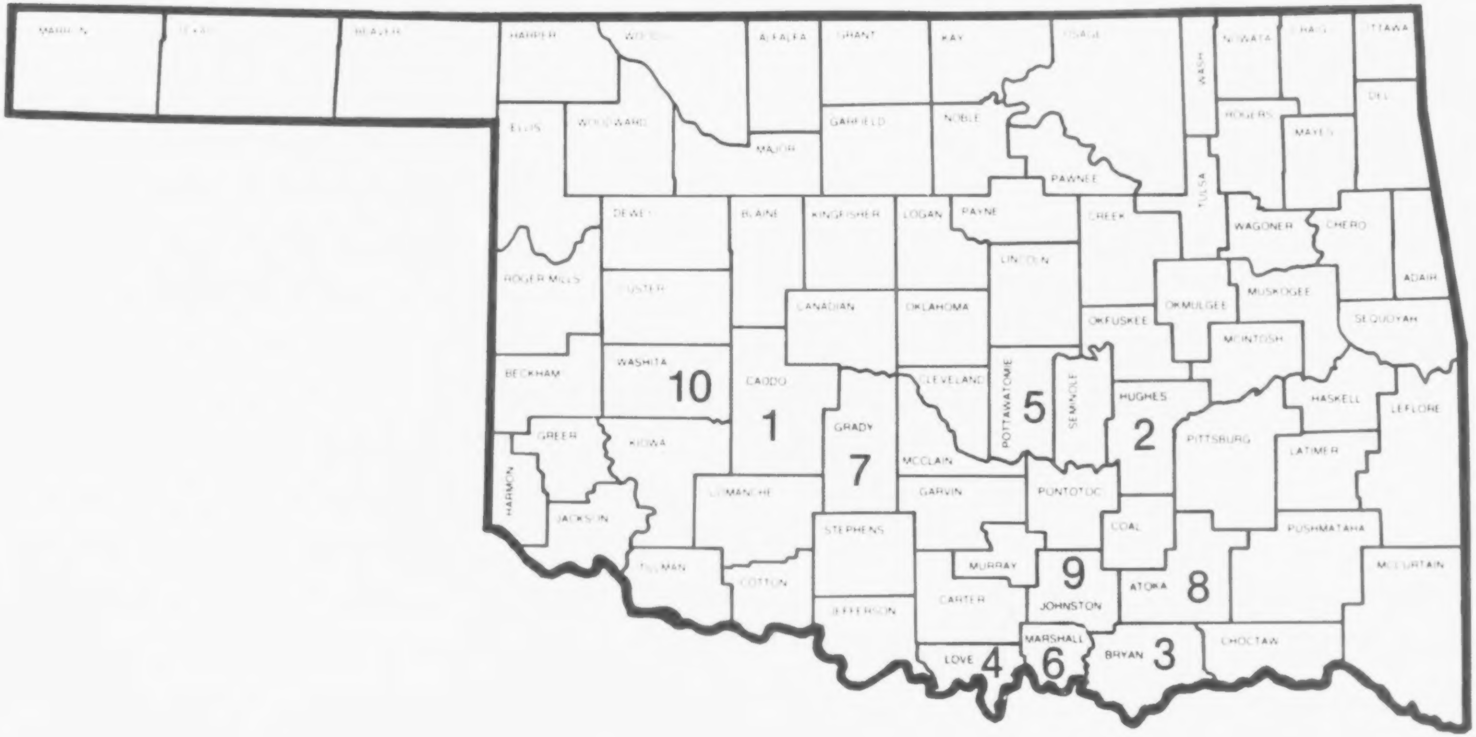
Top 10 Oklahoma Counties in Peanut Production, 1984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BRYAN
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CHOCTAW

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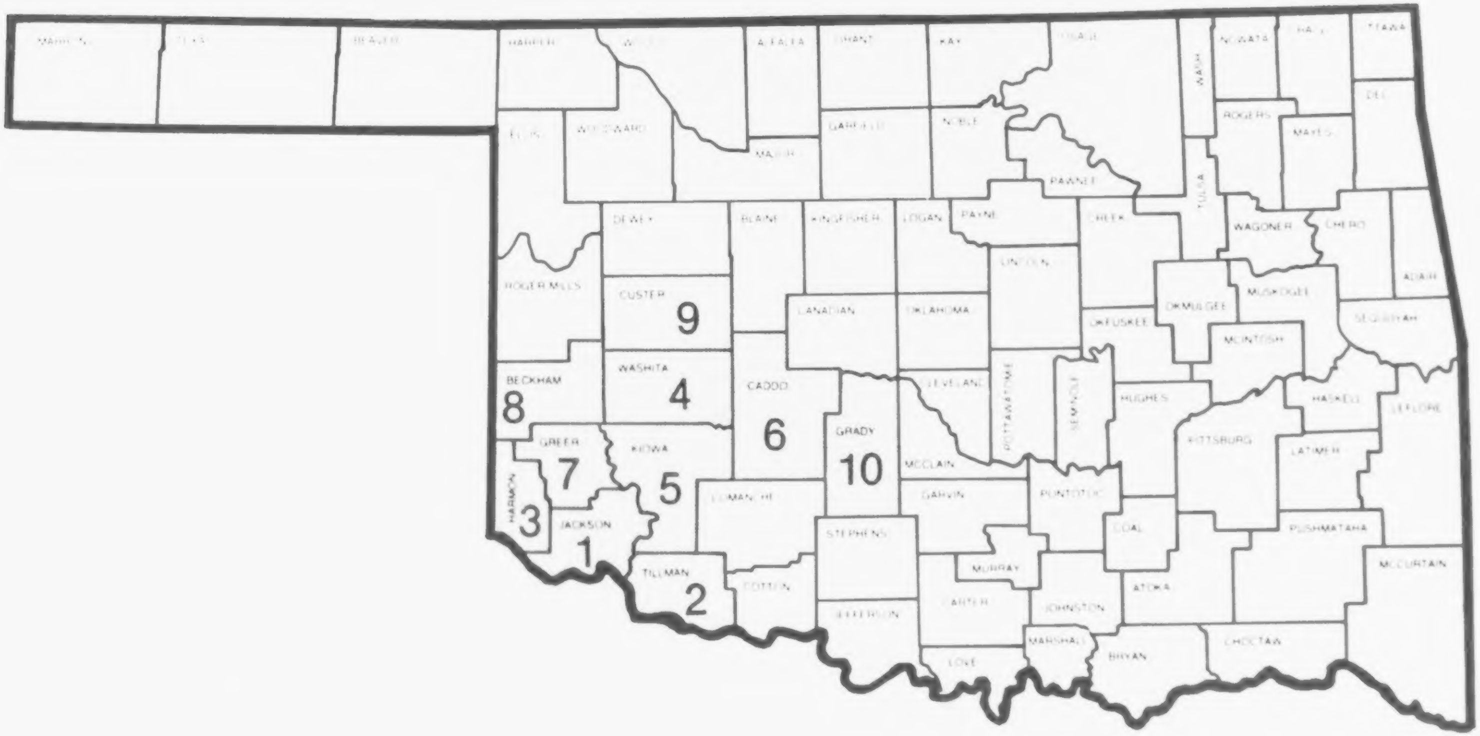
Top 10 Oklahoma Counties in Cotton Production, 1984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JOHNSTON
MARSHALL
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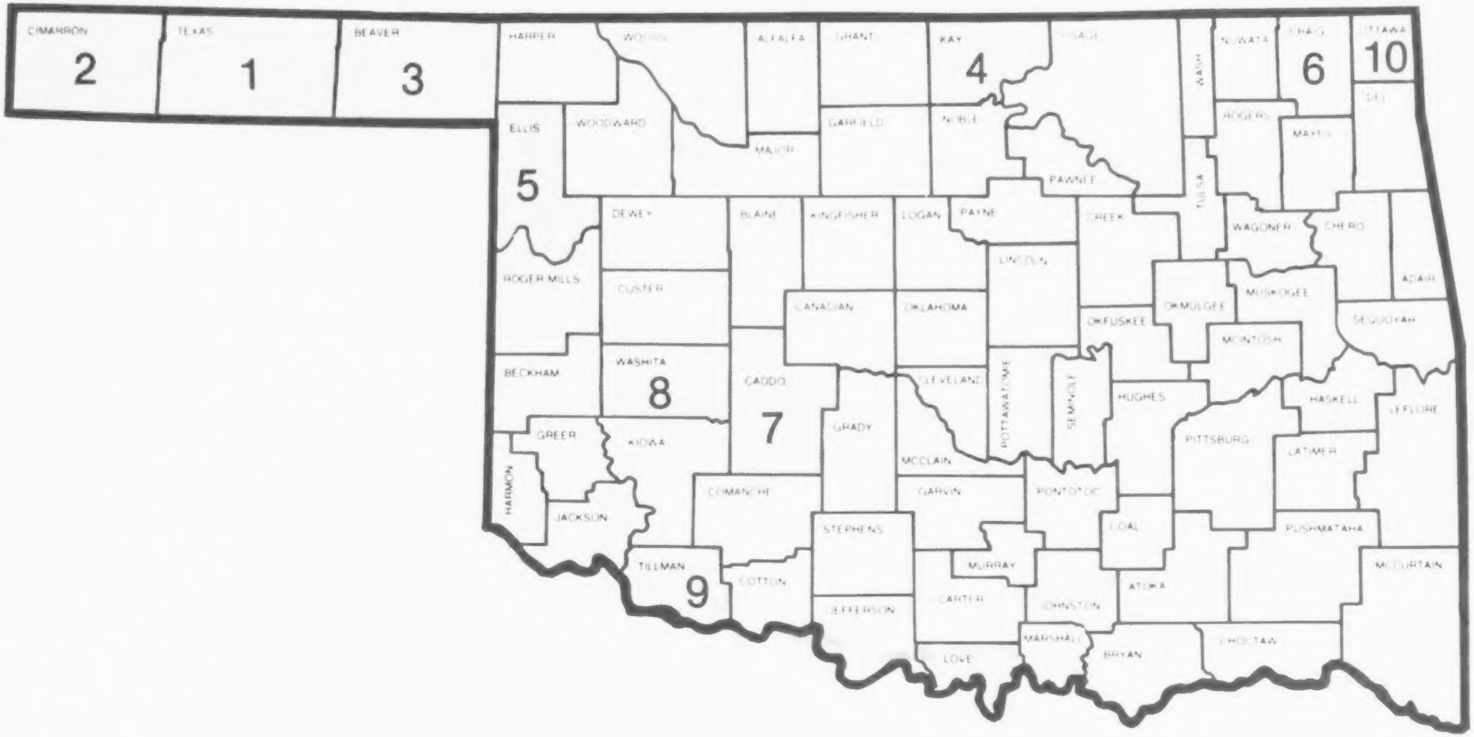
TM #6

Top 10 Oklahoma Counties in Grain Sorghum Production, 1984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MURRAY
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MARSHALL
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BRYAN
CHOCTAW

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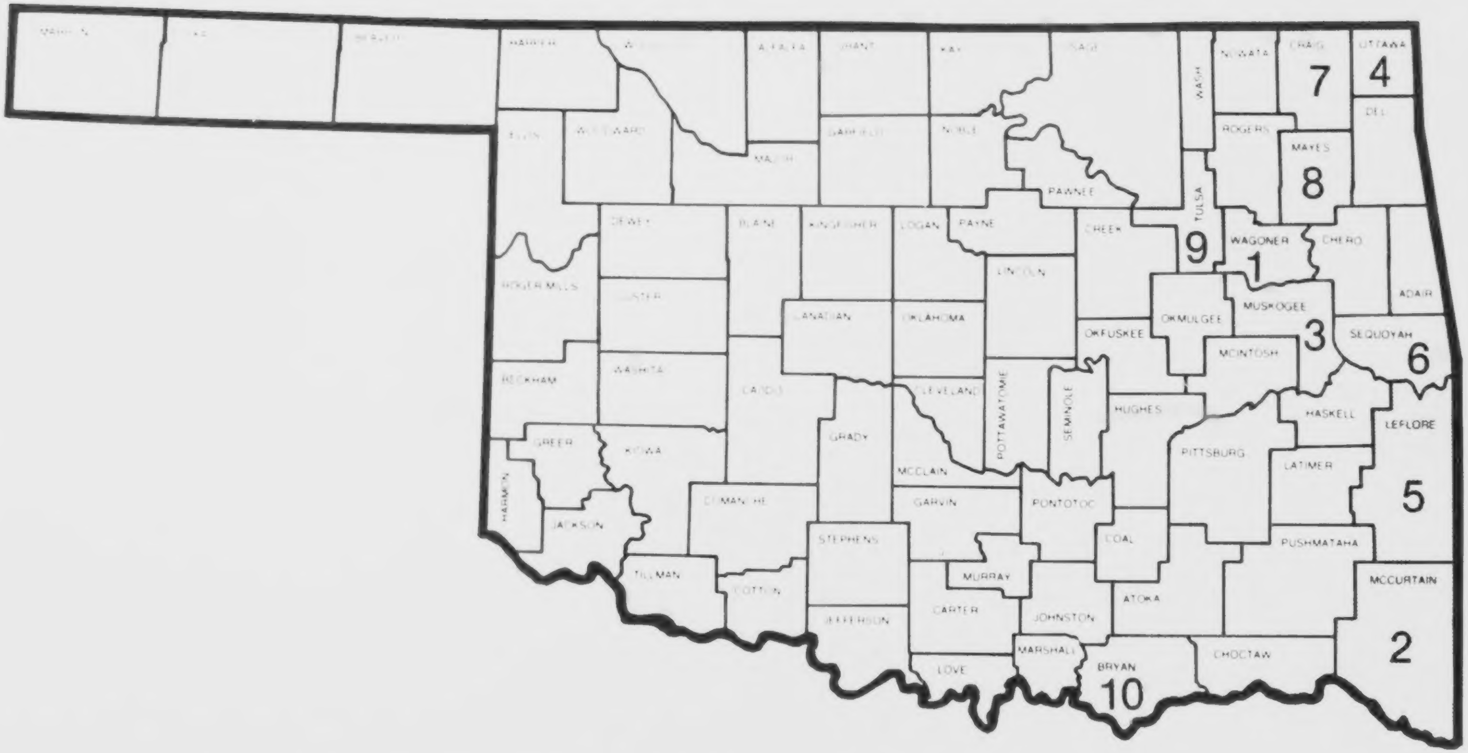
Top 10 Oklahoma Counties in Soybean Production, 1984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TM #8

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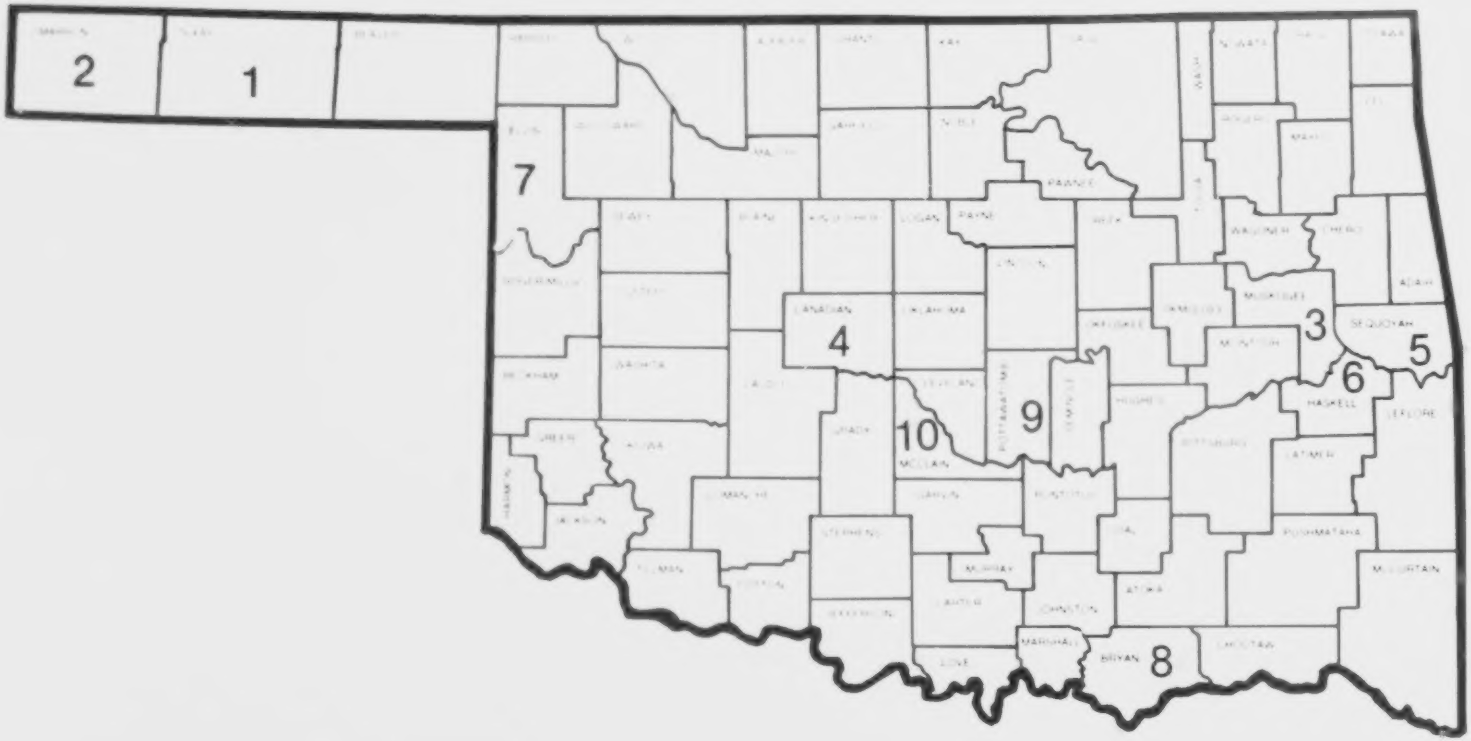
Top 10 Oklahoma Counties in Corn-For-Grain Production, 1984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LEFLORE
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BRYAN
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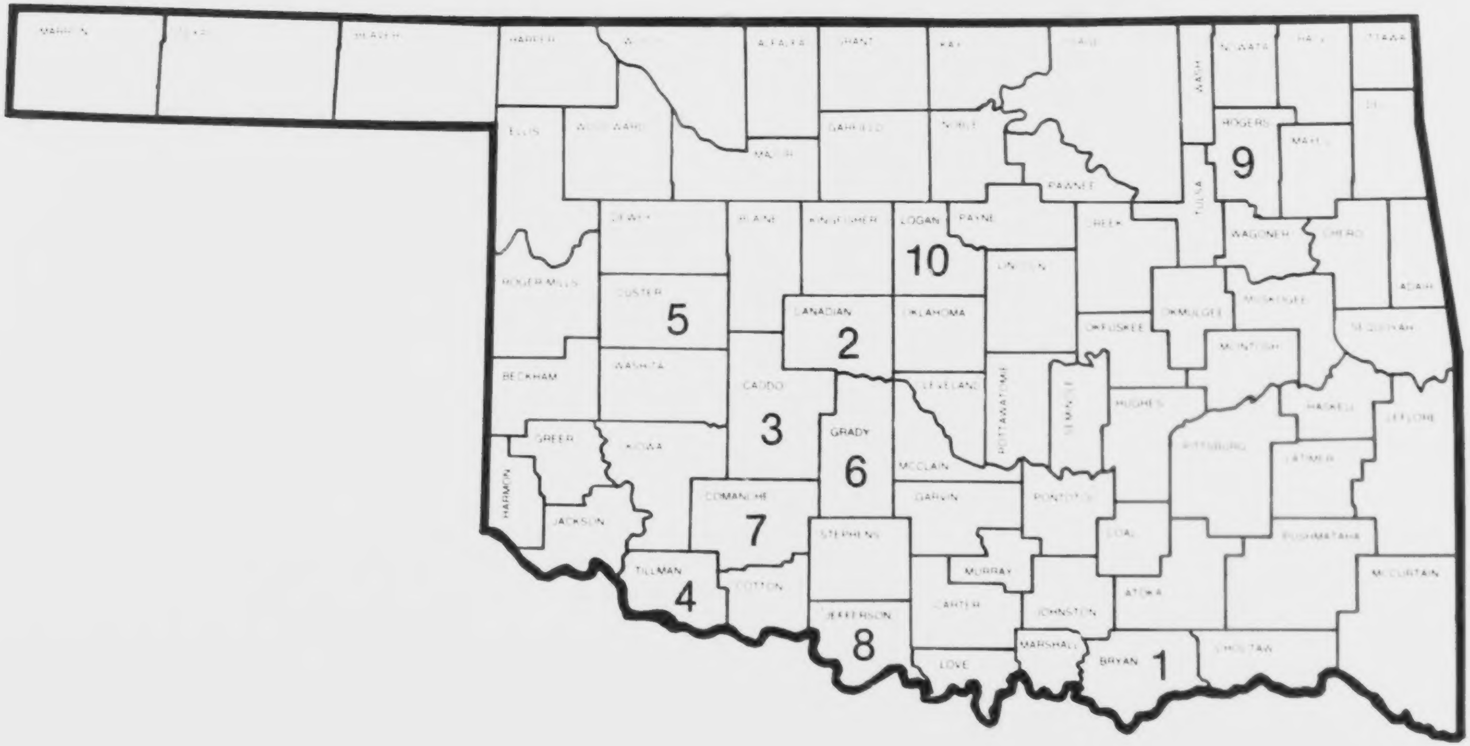
Top 10 Oklahoma Counties in Oats Production, 1984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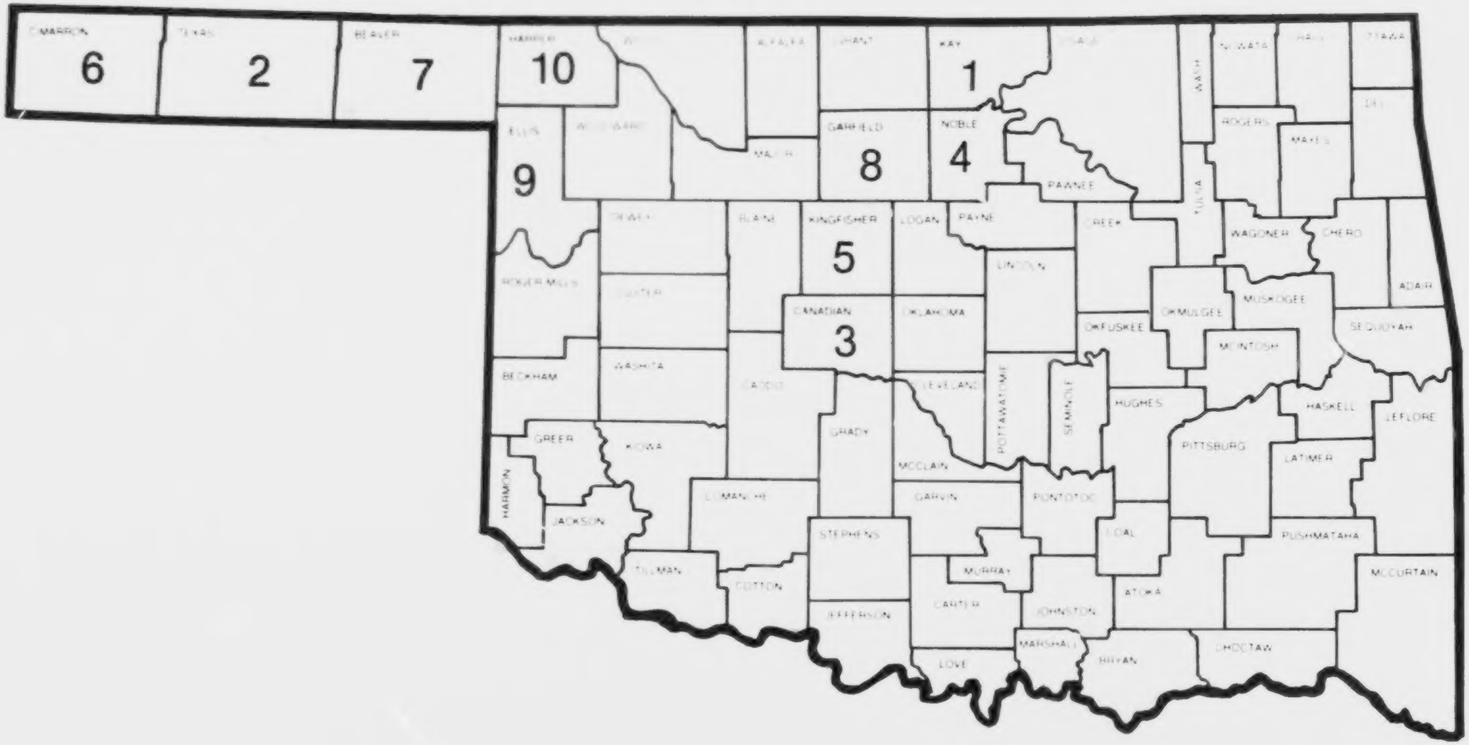
Top 10 Oklahoma Counties in Barley Production, 1984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JOHNSTON
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BRYAN
CHOCTAW

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ANALYZE THE CROP INDUSTRY
UNIT I

INFORMATION SHEET

I. Terms associated with the crop industry

   A. Agricultural industry — Individuals and companies involved in production, processing, and distribution of farm products

   B. Commodity — Product of agriculture such as wheat, cotton, or peanuts

   C. Consumer — Individual who uses agricultural products

   D. Distribution — Means by which agricultural products are made available to consumer

   E. Processing — Preparing farm products for use

      EXAMPLES: Milling wheat, packaging beef, ginning cotton, crushing soybeans

   F. Production — Growing agricultural products

   G. Trends — Direction of movement of a commodity in terms of production and prices

      EXAMPLES: Up, down, steady

   H. Supply — Amount or quantity of goods or services offered for sale by a producer or group of producers in a given market at a given series of prices, over a given time period

      (NOTE: It is usually assumed that as supply increases, the price of the good decreases.)

   I. Demand — Relationship between a good's price and the quantity of the good that consumers are willing and able to purchase

      (NOTE: It is usually assumed that as the price of the good increases, consumers will purchase less of the good.)

   J. Value of production — Amount of a commodity produced times the season average price

      (NOTE: The value of production is usually calculated for total production, per harvested acre, and for total sales.)

INFORMATION SHEET

EXAMPLE: In 1986, 195,000,000 bushels of wheat were produced on 6,500,000 acres. Of this amount, 7,605,000 bushels were used as feed, seed, etc. on the farm where grown, while 187,395,000 bushels were sold. The season average price was $3.83 per bushel. The total value of all production was $746,850,000.00 (195,000,000 × $3.83) or $114.90 per harvested acre ($746,850,000 ÷ 6,500,000). The value of production from sales was $717,723,000.00 (187,395,000 × $3.83).

II. Sequence of phases of the agricultural industry

A. Production

EXAMPLES: Farmers, ranchers

B. Processing

EXAMPLES: Flour mills, packing plants, graders, processing plants

C. Distribution

EXAMPLES: Wholesalers, retailers

D. Consumption

EXAMPLE: Consumers

III. Factors to consider in deciding which crops to grow

A. Economic conditions

EXAMPLES: Government programs; market conditions; prices of commodities; prices of inputs such as feed, seed, fertilizer, machinery, etc.

B. Moisture conditions

EXAMPLES: Rainfall, snowfall, hail, fog, humidity, rate of evaporation

C. Temperature conditions

EXAMPLES: Temperature ranges through the year, dates of spring and fall frosts

D. Topography

(NOTE: Topography refers to the levelness or roughness of the earth's surface, the degree of slope on side hills, and the general form of the earth's surface. Topography is the "lay of the land.")

INFORMATION SHEET

E. Soil conditions

(NOTE: Soil conditions include physical, chemical, and biological characteristics.)

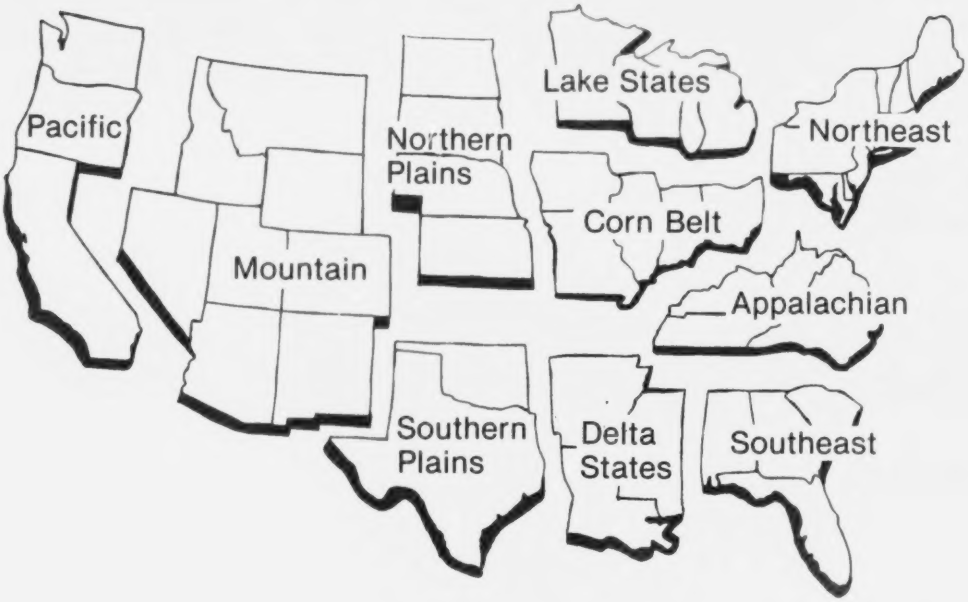
F. Market availability

EXAMPLES: Nearness to markets, available railroad or water transportation, good highways in vicinity, processing plants available

G. Personal likes and dislikes

IV. National farm production regions (Figure 1)

FIGURE 1


Pacific
Mountain
Northern Plains
Lake States
Corn Belt
Northeast
Appalachian
Southern Plains
Delta States
Southeast

Source: *Agricultural Prices, 1983 Summary*, United States Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, June 29, 1984.

A. Northeast

(NOTE: States included are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.)

INFORMATION SHEET

B. Lake States

(NOTE: States included are Michigan, Minnesota, and Wisconsin.)

C. Corn Belt

(NOTE: States included are Illinois, Indiana, Iowa, Missouri, and Ohio.)

D. Northern Plains

(NOTE: States included are Kansas, Nebraska, North Dakota, and South Dakota.)

E. Appalachian

(NOTE: States included are Kentucky, North Carolina, Tennessee, Virginia, and West Virginia.)

F. Southeast

(NOTE: States included are Alabama, Florida, Georgia, and South Carolina.)

G. Delta States

(NOTE: States included are Arkansas, Mississippi, and Louisiana.)

H. Southern Plains

(NOTE: States included are Oklahoma and Texas.)

I. Mountain

(NOTE: States included are Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming.)

J. Pacific

(NOTE: States included are California, Oregon, and Washington.)

V. Major crops grown in Oklahoma

A. Winter wheat

B. All hay

C. Peanuts

D. Cotton

E. Grain sorghum

F. Soybeans

G. Corn for grain

H. Oats

I. Peaches and pecans

J. Barley

K. Rye

INFORMATION SHEET

VI. Reasons for using crop reports

A. To examine historical data to gauge future developments

EXAMPLES: Price trends, production trends, supply and disappearance estimates

B. To determine crop acres to be planted

C. To determine when to market harvested crop

EXAMPLES: Harvest-time, store and sell later

D. To determine method of marketing

EXAMPLES: Cash market, forward contract, hedging with futures contract, agriculture options, storage

E. To determine when to purchase feed for livestock operation

VII. Value of production of major crops grown in Oklahoma (Table 1 and Figure 2)

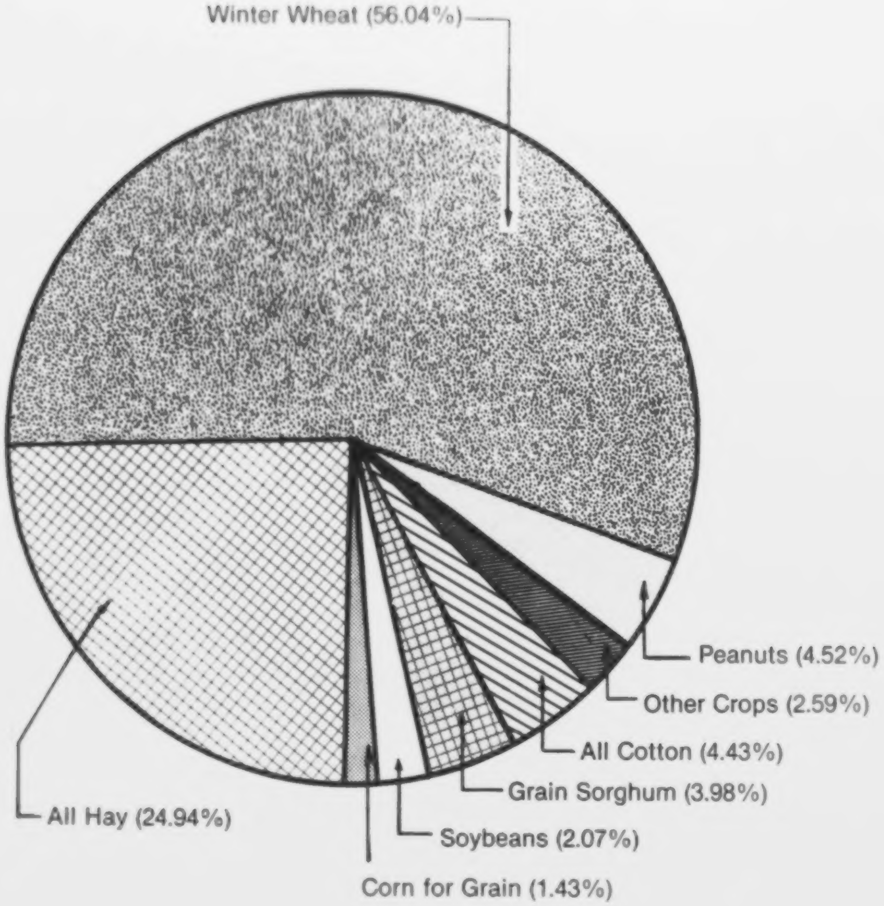
(NOTE: The value of production does not include values for alfalfa, corn, or sorghum harvested for silage. All figures are for 1984.)

TABLE 1

Rank	Crop	Value of production (in thousands of dollars)	Percent of total crop production
1	Winter wheat	$ 639,180	56.04%
2	All hay	284,480	24.94
3	Peanuts	51,597	4.52
4	All cotton	50,503	4.43
5	Grain sorghum	45,360	3.98
6	Soybeans	23,617	2.07
7	Corn for grain	16,275	1.43
8	Peaches and pecans	15,480	1.36
9	Oats	6,992	.61
10	Barley	4,920	.43
11	Rye	2,112	.19
	TOTALS	$1,140,516	100.00%

INFORMATION SHEET

FIGURE 2



Source of information for Table 1 and Figure 2: *Oklahoma Agricultural Statistics, 1984.*

VIII. Descriptions of occupational areas related to the crop industry

A. General farmer — Self-employed individual engaged in raising and harvesting food and feed crops and in raising and breeding livestock and poultry

EXAMPLES: Full-time farmer, part-time farmer, tenant farmer

INFORMATION SHEET

B. Crop farmer — Self-employed individual specializing in raising and harvesting food and feed crops

EXAMPLES: Wheat farmer, cotton farmer, seed grower, vegetable grower, owner or supervisor of orchards, fruit grower, grain farmer

C. Farm hand or laborer — Employee who performs any combination of tasks associated with the planting, cultivating, harvesting, or marketing of crops

EXAMPLES: Manual laborer, machinery operator, agricultural aid, general farm hand, migrant worker, field hauler

D. Manager — Employee responsible for overseeing tasks associated with crop production

EXAMPLES: Farm supervisor, farm manager, orchard manager, truck gardener, field supervisor, ranch manager or foreman

E. Custom worker — Individual who performs farm operations for another farmer

EXAMPLES: Agricultural pest exterminator, crop duster, crop sprayer, custom farm machine operator, custom combiner, fruit caretaker, lime spreader, bermuda grass sprigger

F. Agricultural service — Individual who works directly with farmers, farm real estate, or crops in capacity closely related to crop production

EXAMPLES: Supervisor for hybrid seed company, vegetable production field supervisor, agricultural credit representative, irrigation scheduler, crop consultant, crop pest scout, urban land use planner, vocational agriculture teacher, extension crop or soil specialist, county extension agent

G. Agricultural supplies — Individual who performs tasks associated with the sale and distribution of farm supplies and equipment

EXAMPLES: Feed mill equipment operator, seed analyst, fertilizer or chemical applicator, supplies salesperson, supply store manager, supply store employee, agricultural chemical product representative, farm equipment salesperson, farm equipment repairperson

H. Marketing services — Individual who performs essential marketing tasks such as grading, sorting, storing, and mixing, as well as selling

EXAMPLES: Country grain elevator manager, cotton gin manager, grain elevator sales manager, grain buyer, elevator salesperson, grain inspector, grain sampler, grain weigher, cannery or processing plant employee, fruit and vegetable grader

INFORMATION SHEET

I. Research and teaching — Individual who supervises programs carried on by universities and agribusiness organizations

EXAMPLES: Agronomist, botanist, entomologist, plant pathologist, geneticist, agricultural economist, rural sociologist, agricultural chemist, soil conservationist, vocational agriculture teacher, agricultural extension specialist, agriculture loan specialist, crop physiologist, soil chemist, soil physicist, soil microbiologist, plant biochemist, plant breeder, genetic engineer

J. Accounting services — Individual who provides financial services or agricultural education

EXAMPLES: Loan representative for bank, farm credit system, or Farmers Home Administration; accountant for farm records service; field representative for farm management association; Farm Business Management instructor

ANALYZE THE CROP INDUSTRY
UNIT I

ASSIGNMENT SHEET #1 — INTERPRET GENERAL TRENDS OF THE CROP INDUSTRY

NAME ______________________ SCORE ____________

Since the early 1960s there have been several trends affecting the crop industry. For instance, the *Oklahoma Agricultural Statistics, 1984* publication showed the following:

> The 1984 wheat crop, at 191 million bushels, was the fourth largest recorded, exceeded by 1979, 1980, and 1982 crops. It resulted from the second highest yield of record, 36 bushels per acre, and 5.3 million acres harvested. Acreage harvested was 23 percent greater than the previous year and accounted for 69 percent of the 7.7 million acres seeded.
>
> Cotton yielded an average of 234 pounds per acre; grain sorghum, 40 bushels per acre; soybeans, 19 bushels per acre; and corn, 105 bushels per acre. Hot, dry weather during the critical pollination stage contributed to lower corn yields.
>
> Peanut production totaled 189 million pounds from 91,000 acres. Abandonment was higher than normal as cool, wet conditions in southeastern counties rotted peanuts in the ground as well as some after being dug.
>
> Summer drought conditions reduced native grass hay yields. Alfalfa hay yields, however, equalled the previous year. Acreage harvested was unchanged and the net result was a decline of 4 percent in total production. Hay carryover stocks were 16 percent greater than the previous year as the winter was milder than expected.

Farmers who can follow and forecast crop trends can make better economic decisions. In this assignment you will be using the most current version of *Oklahoma Agricultural Statistics* to plot inventory information on graphs. Record data on graphs and answer questions presented in each part of this assignment sheet.

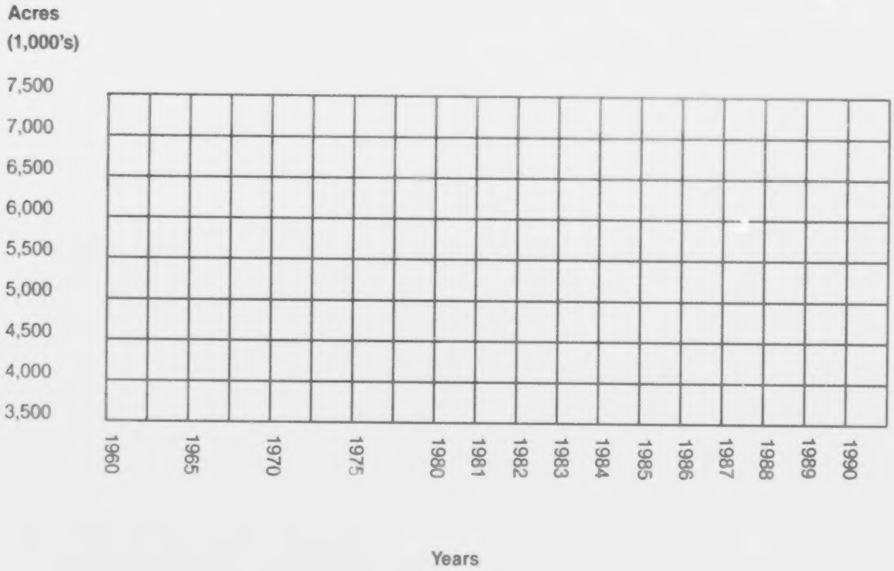
ASSIGNMENT SHEET #1

PART I — Winter Wheat (Oklahoma)

Read the following data on winter wheat, and record on the graphs below.

A. Harvested acres (1960 to present)

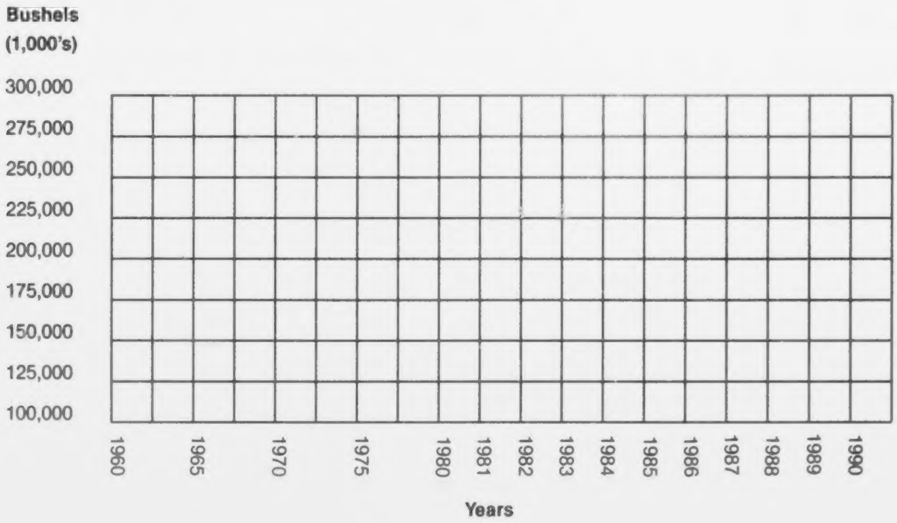
1960	4,665,000	1981	6,400,000
1965	4,747,000	1982	6,900,000
1970	3,900,000	1983	4,300,000
1975	6,700,000	1984	5,300,000
1980	6,500,000	1985	



ASSIGNMENT SHEET #1

B. Production (total bushels for 1960 to present)

1960	121,290,000	1981	172,800,000
1965	132,916,000	1982	227,700,000
1970	101,400,000	1983	150,500,000
1975	160,800,000	1984	190,800,000
1980	195,000,000	1985	



C. Answer the following questions about winter wheat. Write your answers in the blanks provided.

1. What year was the number of harvested acres the highest? ____________________
2. What year was the total bushels harvested the highest? ____________________
3. Why did acres harvested and total production drop from 1982 to 1983? __________
   ____
4. Are harvested acres up or down this year? ____________________
5. Is total production up or down this year? ____________________

ASSIGNMENT SHEET #1

PART II

Select a major crop grown in Oklahoma. Using the most current copy of *Oklahoma Agricultural Statistics* plot the harvested acres and total production on the following graphs. After completion of the graphs, interpret the general trends of the crop selected.

A. Crop selected: ____________________

B. Harvested acres

C. Production

D. Interpretation

____

____

____

____

____

____

ANALYZE THE CROP INDUSTRY
UNIT I

ASSIGNMENT SHEET #2 — INTERPRET PRICE CHANGES IN THE CROP INDUSTRY

NAME ______________________________________ SCORE ________________

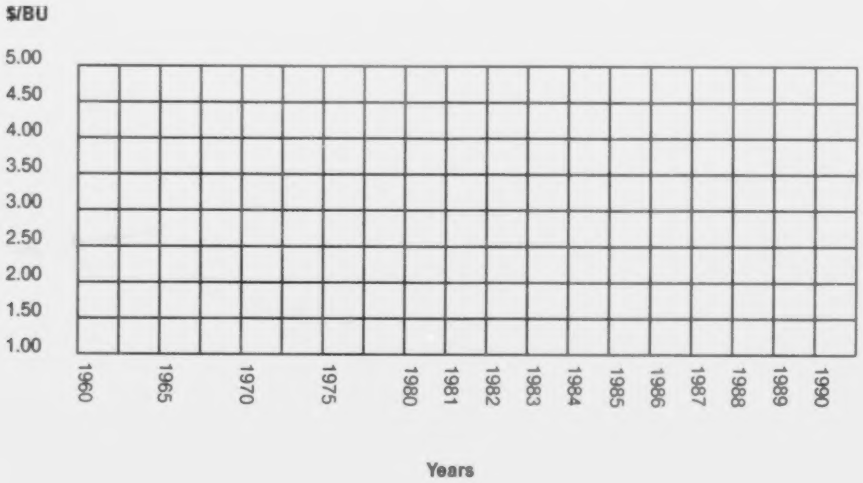
Prices received by farmers for their products is one of the primary factors causing farmers to expand or to decrease their cropping operations. In this assignment, you will use the most current version of the *Oklahoma Agricultural Statistics* to plot prices received by farmers for their crop products. Record data on graphs and answer questions presented in each part of the assignment sheet.

PART I — Winter Wheat (Oklahoma)

Read the following data on winter wheat, and record on the graphs below.

A. Season average prices received

1960	$1.75	1981	$3.83
1965	$1.36	1982	$3.65
1970	$1.33	1983	$3.51
1975	$3.43	1984	$3.35
1980	$3.83	1985	

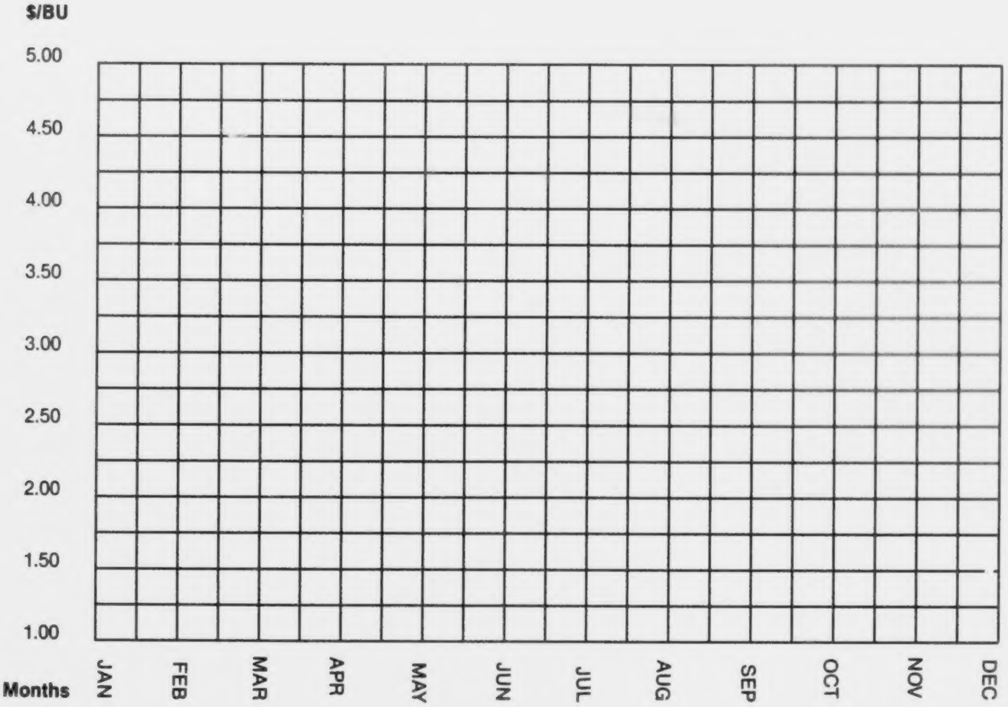


ASSIGNMENT SHEET #2

B. Monthly prices received

(NOTE: When graphing monthly prices received use different colors or types of lines for each year.)

Commodity & Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				—Dollars per Bushel—								
WINTER WHEAT												
1960	1.83	1.87	1.92	1.91	1.81	1.68	1.69	1.72	1.78	1.78	1.79	1.80
1970	1.29	1.29	1.28	1.29	1.24	1.20	1.21	1.27	1.41	1.41	1.43	1.42
1975	4.00	3.76	3.41	3.41	3.11	2.87	3.39	3.73	3.85	3.78	3.39	3.22
1981	4.23	4.03	3.94	3.99	3.82	3.82	3.76	3.83	3.87	3.77	4.00	3.92
1982	3.91	3.84	3.77	3.84	3.76	3.47	3.39	3.33	3.37	3.40	3.43	3.49
1983	3.54	3.54	3.69	3.60	3.44	3.27	3.24	3.39	3.52	3.42	3.40	3.42
1984	3.44	3.33	3.42	3.53	3.47	3.35	3.30	3.40	3.48	3.47	3.42	3.37



ASSIGNMENT SHEET #2

C. Answer the following questions about winter wheat. Write your answers in the blanks provided.

1. In what years were the highest season average prices received? ________________

2. Why do monthly prices received tend to rise after the harvest months of June and July?

   ____

   ____

3. Why have prices dropped from 1981 through 1984?

   ____

   ____

   ____

PART II

Select a major crop grown in Oklahoma. Using the most current copy of *Oklahoma Agricultural Statistics* plot the season average prices received and monthly prices received on the following graphs. After completion of the graphs, interpret the general trends of the crop selected.

A. Crop selected: ____

B. Season average prices received

ASSIGNMENT SHEET #2

C. Monthly prices received

D. Interpretation

ANALYZE THE CROP INDUSTRY
UNIT I

ASSIGNMENT SHEET #3 — INTERPRET USDA SUPPLY AND DISAPPEARANCE ESTIMATES

NAME ______________________________ SCORE ______________

Periodically the United States Department of Agriculture (USDA) issues crop reports showing supply and disappearance estimates for various crops. These reports estimate the supply of the crop on hand, both on farms and in commercial channels. By subtracting what is on hand from the beginning supplies, a person can determine how much has disappeared both domestically and in exports. At the same time, with these utilization figures, it becomes possible to make estimates on how much may be used the remainder of the crop year, and finally, how much should be left over (carried over) when the new harvests begin.

Following are USDA supply and disappearance estimates for a feed crop (corn), a food crop (wheat), an oil crop (soybeans), and a fiber crop (cotton). Carefully study and interpret the estimates by answering the questions that follow the estimates.

CORN	1983-84	1984-85
	(million bushels)	
Beginning stocks	3,120	587
Production	4,167	7,669
Total supply	7,287	8,256
Feed use	3,875	4,100
Food/ind./seed use	975	1,050
Exports	1,850	2,050
Total usage	6,700	7,200
Carryover	587	1,056
Average farm price	$3.25	$2.70-$3.05

WHEAT	1983-84	1984-85
	(million bushels)	
Beginning stocks	1,515	1,394
Production	2,424	2,528
Total supply	3,939	3,922
Domestic use*	1,116	1,117
Exports	1,429	1,475
Total usage	2,545	2,592
Carryover	1,394	1,330
Average farm price	$3.54	$3.30-$3.55

*Includes food, seed, and feed

ASSIGNMENT SHEET #3

SOYBEANS	1983-84	1984-85
	(million bushels)	
Beginning stocks	345	95
Production	1,567	2,035
Total supply	1,912	3,130
Crush*	980	990
Feed, seed, etc.	77	90
Exports	760	800
Total usage	1,817	1,880
Carryover	95	250
Average farm price	$7.75	$5.60-$7.60

*for oil

COTTON	1983-84	1984-85
	(million bales)	
Beginning stocks	7.9	3.1
Production	7.8	12.6
Total supply	15.7	15.7
Mill use	5.8	5.5
Exports	6.8	5.7
Total usage	12.6	11.2
Carryover	3.1	4.6
Average farm price	66.6¢/lb.	55¢-70¢/lb.

A. Why is the estimated average farm price for corn in 1984-85 lower than the price received in 1983-84?

____

____

____

B. What is the estimated carryover bushels of wheat for 1984-85? ____________________

ASSIGNMENT SHEET #3

C. What effect does the estimated supply and usage have on the estimated average farm price for wheat in 1984-85?

D. Why is the estimated 1984-85 carryover for cotton higher than in 1983-84?

E. Why is the estimated 1984-85 carryover for soybeans higher than in 1983-84?

ANALYZE THE CROP INDUSTRY
UNIT I

ASSIGNMENT SHEET #4 — GATHER INFORMATION ABOUT A CROP INDUSTRY OCCUPATION

NAME ______________________________ SCORE ____________

One of the most important decisions you will ever make is your choice of a career. This choice will determine the satisfaction you get from your work and the opportunities you have for promotion and advancement. It may determine the wages or salary you receive and whether you will have regular or part-time employment. Your choice of a career may determine the people with whom you will associate, where you will live, and how often you will see your family. It may also affect your health, attitudes, interests, and sense of values. In general, your career may determine the kind of person you become.

Using the following form, gather information about an occupation in the crop industry that interests you.

EXAMPLE:

Occupation: Grain elevator employee

Description and nature of work: A grain elevator employee loads, unloads, and in other ways handles and cares for grain at an elevator. This work is usually limited to the grain-growing regions of the United States. A grain elevator employee unloads grain from growers' vehicles, inspects it, keeps records of type and amount, handles it within the elevator, and loads it for transportation. This work may include blending grains, operating a grain dryer, taking samples for moisture tests, testing grain for moisture, and maintaining equipment. At the higher levels of employment, a knowledge of means of transportation and markets is important.

Working conditions: Working conditions around a grain elevator are usually dusty. An employee's work may be heavy, manual labor, or much of it may be simple operation of machinery and equipment. The work is likely to be seasonal with a peak load during harvest time.

Educational and personal qualifications: No particular educational requirements are necessary to enter this occupation, although high school vocational agriculture courses may be helpful. Work experience at an elevator on a part-time basis while in high school would also be helpful. A grain elevator employee should be in good physical condition to withstand the dust, to work in the heat, to work in unheated areas, and to perform certain manual chores that may be required.

How to enter and advance: Physically strong and alert persons may be eligible to enter this occupation as laborers. Advancement will largely be based on experience, willingness to learn and apply certain skills and types of information, and willingness to accept responsibility. Advancement may be from laborer to supervisor or to some other responsible position.

Adapted with permission of The Interstate Printers & Publishers, Inc., from *Handbook of Agricultural Occupations*, 4th ed., by Norman K. Hoover, 1985.

ASSIGNMENT SHEET #4

Occupation: ______________________________

Description and nature of work: ______________________________

____

____

____

____

____

____

____

____

____

____

Working conditions: ______________________________

____

____

____

____

Educational and personal qualifications: ______________________________

____

____

____

____

____

____

____

ASSIGNMENT SHEET #4

How to enter and advance: ______________________________

____

____

____

____

____

____

Source of information: ______________________________

____

____

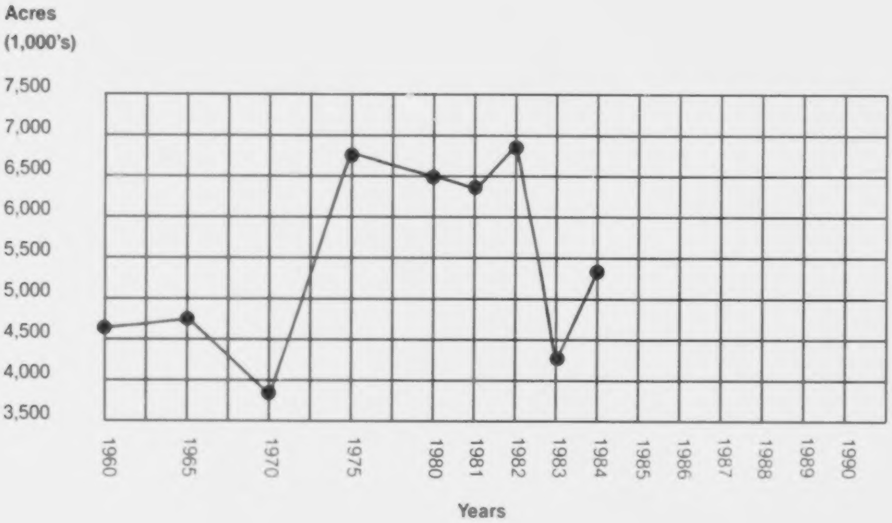
ANALYZE THE CROP INDUSTRY
UNIT I

ANSWERS TO ASSIGNMENT SHEETS

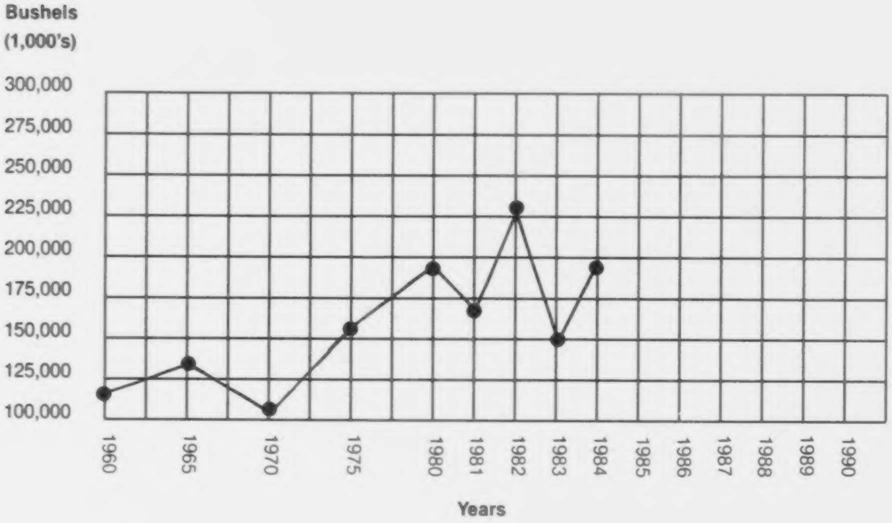
Assignment Sheet #1

PART I

A.



B.



ANSWERS TO ASSIGNMENT SHEETS

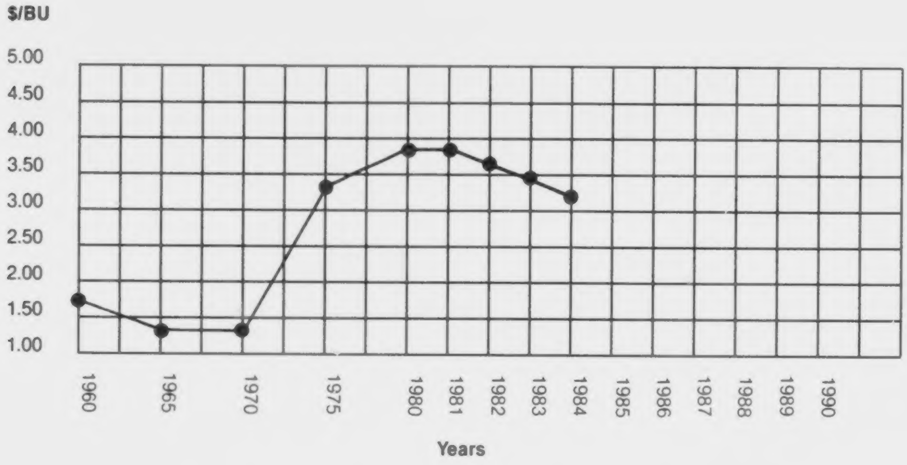
C.
1. 1982
2. 1982
3. Evaluated to the satisfaction of the instructor; discussion should point out effects of climate and government PIK program
4. Evaluated to the satisfaction of the instructor
5. Evaluated to the satisfaction of the instructor

PART II — Evaluated to the satisfaction of the instructor

Assignment Sheet #2

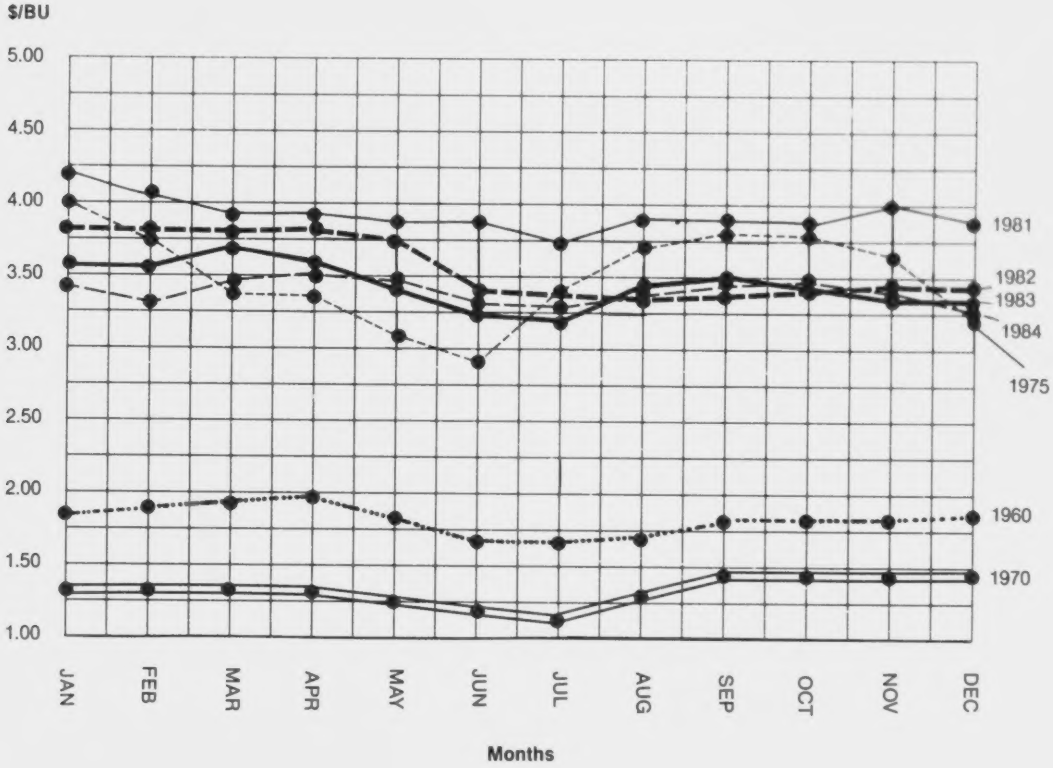
PART I

A.



ANSWERS TO ASSIGNMENT SHEETS

B.



C. 1. 1980 and 1981
   2. Evaluated to the satisfaction of the instructor; answer should include comments on costs of storage and transportation
   3. Evaluated to the satisfaction of the instructor; answer should include comments on harvested acres, total production, and effects of government programs

PART II — Evaluated to the satisfaction of the instructor

Assignment Sheet #3

A. Answer should include the following: Increased production, stable or slight increase in usage, estimated carryover more than twice as much as previous year, law of supply and demand (when supply increases without a similar increase in demand, price will fall)

B. 1,330,000,000 bushels, or one billion 330 million bushels

ANSWERS TO ASSIGNMENT SHEETS

C. Answer should include the following: Total supply is down slightly from previous year (3,939 to 3,922), total demand is up slightly (2,545 to 2,592), average farm price should remain fairly stable

D. Answer should include the following: Increase production from previous year (7.8 million bales to 12.6 million bales), decrease in exports

E. Answer should include the following: Increased production from previous year without a substantial increase in usage

Assignment Sheet #4 — Evaluated to the satisfaction of the instructor

ANALYZE THE CROP INDUSTRY
UNIT I

TEST

NAME ______________________________ SCORE ______________

1. Match to their correct definitions terms associated with the crop industry. Write the correct numbers in the blanks.

______a. Individuals and companies involved in production, processing, and distribution of farm products

______b. Product of agriculture such as wheat, cotton, or peanuts

______c. Individual who uses agricultural products

______d. Means by which agricultural products are made available to consumer

______e. Preparing farm products for use

______f. Growing agricultural products

______g. Direction of movement of a commodity in terms of production and prices

______h. Amount or quantity of goods or services offered for sale by a producer or group of producers in a given market at a given series of prices, over some given time period

______i. Relationship between a good's price and the quantity of the good that consumers are willing and able to purchase

______j. Amount of a commodity produced times the season average price

1. Demand
2. Trends
3. Processing
4. Consumer
5. Agricultural industry
6. Value of production
7. Supply
8. Production
9. Distribution
10. Commodity

2. Arrange in order phases of agricultural industry. Place a "1" in the blank before the first phase, a "2" in the blank before the second phase, and so on.

______a. Distribution

______b. Production

______c. Consumption

______d. Processing

TEST

3. State six factors to consider in deciding which crops to grow.

a. ____________________

b. ____________________

c. ____________________

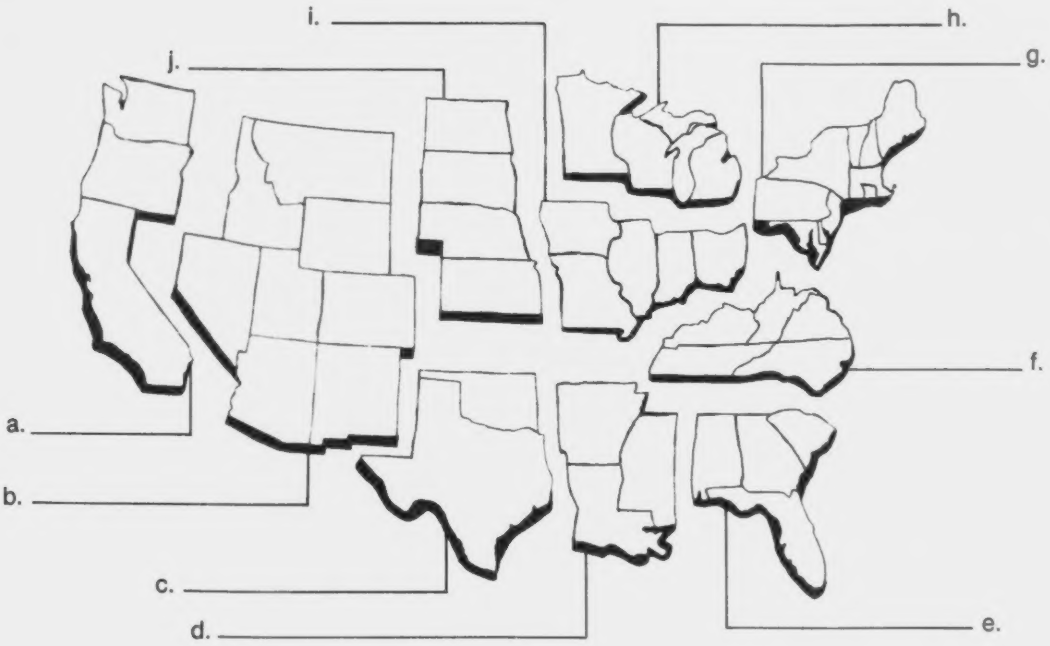
d. ____________________

e. ____________________

f. ____________________

4. Identify national farm production regions. Write the correct names in the blanks.

Pacific
Lake States
Southeast
Northern Plains
Southern Plains
Corn Belt
Appalachian
Mountain
Northeast
Delta States



TEST

5. Name six major crops grown in Oklahoma.

   a. ____________________

   b. ____________________

   c. ____________________

   d. ____________________

   e. ____________________

   f. ____________________

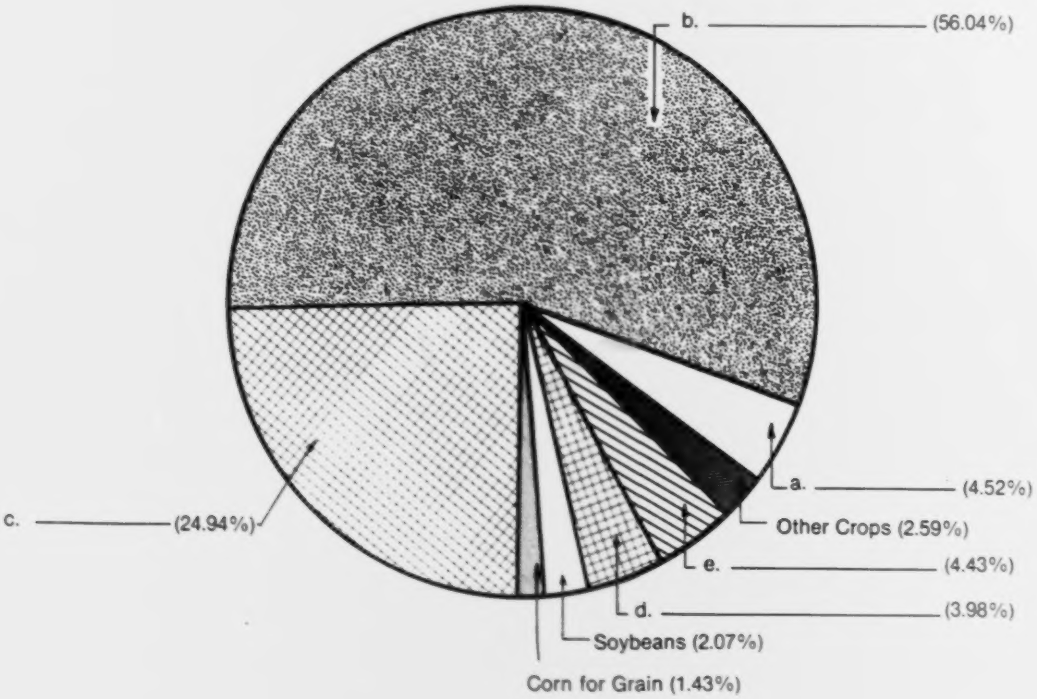
6. State three reasons for using crop reports.

   a. ____________________

   b. ____________________

   c. ____________________

7. Label a pie chart showing the value of production of major crops grown in Oklahoma. Write the correct names of the top five crops in the blanks.



TEST

8. Match to their correct descriptions occupational areas related to the crop industry. Write the correct numbers in the blanks.

______a. Self-employed individual engaged in raising and harvesting food and feed crops and in raising and breeding livestock and poultry

______b. Self-employed individual specializing in raising and harvesting food and feed crops

______c. Employee who performs any combination of tasks associated with the planting, cultivating, harvesting, or marketing of crops

______d. Employee responsible for overseeing tasks associated with crop production

______e. Individual who performs farm operations for another farmer

______f. Individual who works directly with farmers, farm real estate, or crops in capacity closely related to crop production

______g. Individual who performs tasks associated with the sale and distribution of farm supplies and equipment

______h. Individual who performs essential marketing tasks such as grading, sorting, storing, and mixing, as well as selling

______i. Individual who supervises programs carried on by universities and agribusiness organizations

______j. Individual who provides financial services or agricultural education

1. Research and teaching
2. Agricultural supplies
3. Custom worker
4. Farm hand or laborer
5. General farmer
6. Crop farmer
7. Manager
8. Agricultural service
9. Marketing services
10. Accounting services

(NOTE: Test items 9 through 12 list the assignment sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

9. Interpret general trends of the crop industry.

10. Interpret price changes in the crop industry.

11. Interpret USDA supply and disappearance estimates.

12. Gather information about a crop industry occupation.

ANALYZE THE CROP INDUSTRY
UNIT I

ANSWERS TO TEST

1.
    a. 5
    b. 10
    c. 4
    d. 9
    e. 3
    f. 8
    g. 2
    h. 7
    i. 1
    j. 6

2.
    a. 3
    b. 1
    c. 4
    d. 2

3. Answer should include any six of the following

    a. Economic conditions
    b. Moisture conditions
    c. Temperature conditions
    d. Topography
    e. Soil conditions
    f. Market availability
    g. Personal likes and dislikes

4.
    a. Pacific
    b. Mountain
    c. Southern Plains
    d. Delta States
    e. Southeast
    f. Appalachian
    g. Northeast
    h. Lake States
    i. Corn Belt
    j. Northern Plains

5. Answer should include any six of the following

    a. Winter wheat
    b. All hay
    c. Peanuts
    d. Cotton
    e. Grain sorghum
    f. Soybeans
    g. Corn for grain
    h. Oats
    i. Peaches and pecans
    j. Barley
    k. Rye

ANSWERS TO TEST

6. Answer should include any three of the following
    - a. To examine historical data to gauge future developments
    - b. To determine crop acres to be planted
    - c. To determine when to market harvested crop
    - d. To determine method of marketing
    - e. To determine when to purchase feed for livestock operation

7. a. Peanuts
    - b. Winter wheat
    - c. All hay
    - d. Grain sorghum
    - e. All cotton

8.
a.	5	f.	8
b.	6	g.	2
c.	4	h.	9
d.	7	i.	1
e.	3	j.	10

9. Evaluated to the satisfaction of the instructor

10. Evaluated to the satisfaction of the instructor

11. Evaluated to the satisfaction of the instructor

12. Evaluated to the satisfaction of the instructor

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

UNIT OBJECTIVE

After completing this unit, the student should be able to determine land-capability classes and select land treatments for the various land-capability classes. The student will show this ability by completing the assignment sheets, job sheets, and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with selecting soil-conservation practices.
2. Define soil.
3. Label an illustration showing the composition of an average soil.
4. State the benefits of organic matter in soil.
5. Select from a list reasons soil is important.
6. Name factors affecting soil formation in a particular location.
7. State reasons for determining land-capability class.
8. List factors that determine land-capability class.
9. List physical features of a soil that contribute to its texture.
10. Classify major soil-particle groups according to size.
11. Match major soil-texture classifications to their correct soil characteristics.
12. Match subdivisions of the soil-texture classifications to their correct soil characteristics.
13. Match kinds of soil structures to their correct definitions.
14. Match soil colors to the correct soil characteristics indicated by color.
15. Match the horizons in a soil profile to their correct definitions.
16. Match degrees of soil depth to their correct definitions.
17. Match degrees of slope to their correct definitions.

OBJECTIVE SHEET

18. List types of erosion.
19. Match degrees of erosion to their correct definitions.
20. Match categories of water erosion to their correct definitions.
21. List management practices that aid in erosion control.
22. Select from a list wind-erosion conservation practices.
23. Match degrees of permeability to their correct soil characteristics.
24. Match rates of surface runoff to their correct definitions.
25. Match land-capability classes to their correct definitions.
26. Match land-capability class(es) to their correct suitable uses.
27. Select from a list the best land-capability class possible for certain soil factors.
28. List types of recommended land treatments applied to land-capability classes.
29. Match types of vegetative practices to the correct land-capability class(es) each is applied to.
30. Match types of mechanical treatments to their correct uses.
31. State types of fertilizer applications applied to certain soil types.
32. Match factors that may influence land-capability class to the correct land treatments applied to each.
33. Determine degree of erosion.
34. Complete a soil-classification worksheet.
35. Complete a recommended-land-treatment worksheet.
36. Determine land-capability classes and select land treatments.
37. Demonstrate the ability to
    a. Determine soil texture by feel.
    b. Use a slope finder to determine slope.

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

SUGGESTED ACTIVITIES

I. Unit contents

   A. Objective sheet

   B. Suggested activities

      1. Supplements

         a. Supplement #1 — Crossword Puzzle: Selecting Conservation Practices

         b. Supplement #2 — Land Use—Past and Present

         c. Supplement #3 — Using Mechanical Analysis to Determine a Soil's Textural Class

         d. Supplement #4 — Constructing a Slope Finder

         e. Supplement #5 — Word Search: Reasons Why We Need to Conserve Soils

         f. Supplement #6 — Demonstrating the Effectiveness of Two Soil-Conservation Practices

         g. Supplement #7 — Guide to Determining Land-Capability Class and Land-Treatment Practices

      2. Transparency masters

         a. TM #1 — Composition of an Average Soil

         b. TM #2 — Acres of Prime Farmland in Each Farm-Production Region of the United States

         c. TM #3 — Use of Prime Farmland in the United States

         d. TM #4 — Percent of Good Cropland in Each Farm-Production Region of the United States

         e. TM #5 — Important Crops Grown in the United States

         f. TM #6 — Types of Physical Weathering

         g. TM #7 — Soil-Particle Groups Classified According to Size

SUGGESTED ACTIVITIES

h. TM #8 — Kinds of Soil Structures

i. TM #9 — Soil Profile

j. TM #10 — Land Use by Land-Capability Class

C. Information sheet

D. Assignment sheets

1. Assignment Sheet #1 — Determine Degree of Erosion
2. Assignment Sheet #2 — Complete a Soil-Classification Worksheet
3. Assignment Sheet #3 — Complete a Recommended-Land-Treatment Worksheet
4. Assignment Sheet #4 — Determine Land-Capability Classes and Select Land Treatments

E. Answers to assignment sheets

F. Job sheets

1. Job Sheet #1 — Determine Soil Texture by Feel
2. Job Sheet #2 — Use a Slope Finder to Determine Slope

G. Test

H. Answers to test

II. Instructor's guide

A. Review unit and plan presentation.

B. Obtain materials to supplement unit.

1. Booklet — *Land Judging in Oklahoma.* Available from Oklahoma State University Cooperative Extension Service, College of Agriculture, Department of Agronomy, Stillwater, Oklahoma 74078.
2. *Land-Judging Score Card* (85-003035). Available from Vocational Agriculture Division, Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.

   (NOTE: Order at least four land-judging score cards for each student in the class.)

SUGGESTED ACTIVITIES

3. Films

   (NOTE: The following films are available to Oklahoma teachers on a free-loan basis. Oklahoma teachers may order from the Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074. Out-of-state teachers must order from the addresses listed with the films.)

   a. *The Farmer in a Changing America.* Color, 25 minutes, Encyclopedia Britannica Educational Corporation, 1973. Available from Encyclopedia Britannica Educational Corporation, 425 North Michigan Avenue, Chicago, Illinois 60611.

      (NOTE: This film is a documentary record of American farming past, present, and future.)

   b. *Farming with Nature.* Color, 35 minutes, Churchill Films, 1978. Available from Churchill Films, 622 Robertson Boulevard, Los Angeles, California 90060.

      (NOTE: This film shows how a Missouri farmer has returned worn out prairie soil to fertility by close attention to soil minerals and natural principles.)

4. Soil survey map of your area; available from your local Soil Conservation Service office

5. Soil samples from your area

6. Soil-profile samples; available from the local office of the Soil Conservation Service

7. Pictures representative of the various land-capability classes; available from the Soil Conservation Service

8. Equipment and materials needed for job sheets and the supplements

9. Transparencies and competency profiles

   (NOTE: Transparencies and competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, Stillwater, Oklahoma 74074.)

C. Select sites to be used for field trips and for students to use in completing the job sheets.

D. Introduce unit.

SUGGESTED ACTIVITIES

SUGGESTIONS:

- Point out to students that soil and water are the true wealth of the United States. Because we have good soils and enough water, we are able to grow all the food and fiber we need, supply many foreign nations, and still have enough left over to create a worrisome surplus. However, also emphasize that our soil and water resources are not without limits. Soil and water resources have definable limits — limits that are visible in the form of gullies, exhausted land, dust storms, and drought. Yet, despite these visual warnings, we continue to waste soil and water, diminish them, and abuse them.

- Show the film *The Farmer in a Changing America*.

E. Provide students with objective sheet.

F. Discuss unit and specific objectives.

SUGGESTION:

- Point out that the major thrust of this unit will be to make students able to classify land as to its best use and to select soil-conservation treatments that will maintain and conserve the land.

G. Discuss information, assignment, and job sheets.

1. Use Information Sheet, Section I to discuss terms and definitions associated with selecting soil-conservation practices.

   SUGGESTIONS:

   - Stress the importance of the students' being able to understand the words used frequently in discussing soil conservation.

   - Discuss the procedures in Supplement #1.

   - Have students complete Supplement #1.

2. Use Information Sheet, Section II to discuss the definition of soil.

3. Use Information Sheet, Section III to discuss the composition of an average soil.

   SUGGESTION:

   - Use Transparency #1 to illustrate your discussion.

4. Use Information Sheet, Section IV to discuss the benefits of organic matter in soil.

SUGGESTED ACTIVITIES

SUGGESTION:

- Have students brainstorm about sources of organic matter that might be found in the soils in your area.

5. Use Information Sheet, Section V to discuss the reasons soil is important.

SUGGESTIONS:

- Use Supplement #2 to increase students' awareness of how people have used soils in the past and how they are using soils today. First, have your students read the introductory paragraph and the questions in Part I and Part II. Then ask them to brainstorm possible sources for obtaining the information they will need to answer the questions. List their answers on the board. Possible sources include school and public libraries, Native Americans still living in the area, local and state historical societies, museums of natural history, the anthropology department of a university, your school's social studies teachers, and the local Soil Conservation Service office.

  Make students aware that there are no right or wrong answers to the questions in Part II. These questions were designed to stimulate the students to think critically about how we use the land and apply technology today, and their answers will be based upon the opinions they will form as a result of their research. Opinions will vary from one person to another.

- Use Transparency #2 to illustrate the number of acres of prime farmland found per farm-production region in the United States. Point out that *prime* means "best," and that prime farmland is land that is level and well drained and produces high crop yields with the least damage to the soil. Therefore, prime farmland is very important to maintaining farm production. However, in 1977, there were 346 million acres of prime farmland remaining in the United States, but it is estimated that of the 3 million acres of rural land lost to agriculture each year, 1 million acres are prime farmland. The fact that prime farmland is level and well drained makes it as attractive to builders and developers as it is to farmers.

- Use Transparency #3 to illustrate the uses of prime farmland in the United States.

- Use Transparency #4 to illustrate the percent of good cropland in each farm-production region of the United States. Point out that good farmland, research, and applied technology have helped increase the yield per acre over the past years.

- Use Transparency #5 to discuss the important crops grown in the United States.

SUGGESTED ACTIVITIES

6. Use Information Sheet, Section VI to discuss the factors affecting soil formation in a particular location.

   SUGGESTIONS:

   - Point out that parent materials are formed from three types of rocks: igneous (rock derived from the molten materials in the center of the earth's crust), metamorphic (rock formed from the preexisting rocks through the action of extreme heat and great pressures), and sedimentary (rock formed from deposits left by rivers, moving glaciers, or wind).
   - Explain that there are two kinds of weathering: physical and chemical. Define *physical weathering* as "the mechanical forces caused by temperature changes, such as heating and cooling and freezing and thawing." Use Transparency #6 to illustrate your discussion of the types of physical weathering. Define *chemical weathering* as "the chemical reactions of water, oxygen, and carbon dioxide."

7. Use Information Sheet, Section VII to discuss the reasons for determining land-capability class.

   SUGGESTIONS:

   - Emphasize that there are thousands of different soil types in the United States and that precise, detailed information for the management of each type is published on a county basis in soil surveys available from the Soil Conservation Service. However, also point out that a less-precise but simpler guide to land management is presented in this unit — land-capability classes, a guide that divides agricultural land into eight classes, with Class I being the best land for growing crops and Class VIII being unsuitable for growing any crops at all. This guide is widely used by soil conservationists, farmers, and ranchers. Reemphasize the unit objective for this unit.
   - Point out that 85 percent of Class I, II, and III lands are used for cropland, but only 11 percent of Class IV and 4 percent of Classes V through VIII are used for cropland.

8. Use Information Sheet, Section VIII to discuss the factors that determine land-capability class.

   SUGGESTION:

   - Point out that each of the factors presented in the information sheet can keep an area from being classified in Class I.

9. Use Information Sheet, Section IX to discuss the physical features of a soil that contribute to its texture.

   SUGGESTIONS:

   - Point out that natural soils are composed of three types of soil particles: sand, silt, and clay. These soil types are classified according to size, with sand being the coarsest and clay being the finest.

SUGGESTED ACTIVITIES

- Point out that the relative proportion of soil particles in a particular soil determines that soil's textural name, and a soil's color indicates the amount of organic matter and moisture in the soil.

10. Use Information Sheet, Section X to discuss the classification of the major soil-particle groups according to size.

    SUGGESTION:

    - Use Transparency #7 to illustrate your discussion.

11. Use Information Sheet, Sections XI and XII to discuss the soil characteristics of the major soil-texture classifications and their subdivisions.

    SUGGESTIONS:

    - Take students on a field trip to gather sample soil textures.
    - Explain that three major soil-texture classes (sand, silt, and clay) and five subclasses are recognized in the land-classification system presented in the information sheet and assignment sheets of this unit. These textural classes are determined by the relative proportions of sand, silt, or clay in the soil. Soils that have a high proportion of sand are given the textural-class name of *sand*; soils with a high proportion of silt are given the textural-class name of *silt*; and soils with a high proportion of clay are given the textural-class name of *clay*.
    - Point out that students will hear the term *loam* in association with soil-texture classification. Loam is a soil that contains about 20 percent or less clay and near equal amounts of sand and silt in the remaining 80 percent.
    - Discuss the procedures in Job Sheet #1.
    - Have students complete Job Sheet #1.
    - Discuss the procedures in Supplement #3.
    - Have students complete Supplement #3.

12. Use Information Sheet, Section XIII to discuss kinds of soil structures and their definitions.

    SUGGESTION:

    - Use Transparency #8 or show soil-profile samples of your area to illustrate your discussion.

13. Use Information Sheet, Section XIV to discuss soil colors and the soil characteristics indicated by color.

SUGGESTED ACTIVITIES

14. Use Information Sheet, Section XV to discuss the horizons in a soil profile and their definitions.

    SUGGESTIONS:

    - Use Transparency #9 to illustrate your discussion.
    - Take students on a field trip and have them dig along a fence row to expose the layers of the soil profile.

15. Use Information Sheet, Section XVI to discuss the degrees of soil depth and their definitions.

    SUGGESTIONS:

    - Explain that soil depth is the total thickness of topsoil and subsoil down to parent material.
    - Take students on a field trip. Have them use a shovel or posthole digger to dig a hole down to the parent material. Have students measure the depth of the hole. Using soil from this hole, students could also practice determining the texture of the topsoil (surface texture), the depth of the topsoil (erosion), and the texture of the subsoil (permeability).

16. Use Information Sheet, Section XVII to discuss the degrees of slope and their definitions.

    SUGGESTIONS:

    - Review the procedures in Supplement #4, and have students complete their own slope finders, or you construct several slope finders for your students.
    - Discuss the procedures in Job Sheet #2.
    - Have students complete Job Sheet #2 by taking them on a field trip to measure the slope at predetermiend sites. With practice students should be able to estimate slope for a given field without the aid of a slope finder.

17. Use Information Sheet, Section XVIII to discuss the types of erosion.

    SUGGESTIONS:

    - Point out that over 2.5 billion tons of soil are lost annually through soil erosion.
    - Discuss the procedures in Supplement #5.

SUGGESTED ACTIVITIES

- Have students complete Supplement #5.

18. Use Information Sheet, Section XIX to discuss the degrees of erosion and their definitions.

SUGGESTIONS:

- Discuss the procedures in Assignment Sheet #1. Point out that one way to determine the percentage of surface soil that has been removed from a site is to measure the amount of topsoil presently on the site, determine the original amount of topsoil on the site from soil survey maps, subtract the present amount from the original amount, divide that number by the original amount, and then multiply that number by 100.

  For example, if the topsoil at a site measures 10 inches and records indicate that the original topsoil measured at 15 inches, then

  $$15 - 10 = 5$$

  $$5 \div 15 = .33$$

  $$.33 \times 100 = 33\%.$$

- Have students complete Assignment Sheet #1.
- Take students on a field trip and have them determine the degree of erosion at several sites.

19. Use Information Sheet, Section XX to discuss categories of water erosion and their definitions.

SUGGESTION:

- Point out that in 1977 the Soil Conservation Service estimated that more than 2 billion tons of soil were lost through sheet and rill erosion, gully erosion took an additional 450 million tons of soil, and streambank and roadside erosion took even more.

20. Use Information Sheet, Section XXI to discuss management practices that aid in erosion control.

SUGGESTIONS:

- Have each student prepare a list of management practices they have observed in your community.
- Have a representative of the Soil Conservation Service speak to the class about the management practices used in your area.

SUGGESTED ACTIVITIES

- Discuss the procedures in Supplement #6.
- Have students complete Supplement #6.

21. Use Information Sheet, Section XXII to discuss wind-erosion conservation practices.

    SUGGESTIONS:

    - Have someone who experienced the Dust Bowl of the 1930s speak to the class.
    - Show the film *Farming with Nature*.

22. Use Information Sheet, Section XXIII to discuss the degrees of permeability and their soil characteristics.

    SUGGESTION:

    - Point out that *permeability* refers to the ease with which air and water go through the soil.

23. Use Information Sheet, Section XXIV to discuss the rates of surface runoff and their definitions.

    SUGGESTION:

    - Emphasize to students the importance of knowing surface texture and the degree of slope in determining surface runoff.

24. Use Information Sheet, Section XXV to discuss the land-capability classes and their definitions.

    SUGGESTIONS:

    - Have students review Information Sheet, Section V, reasons for determining land-capability classes.
    - Show the class pictures representative of the various land-capability classes.

25. Use Information Sheet, Section XXVI to discuss suitable uses for land-capability classes.

    SUGGESTIONS:

    - Point out that not all soils are suitable for cultivation. Almost all of America's Class I land is being used to grow crops. Class II and III lands supply the majority of our cropland, but they require the application of conservation measures. There are also about 50 million acres of cropland in Class IV, but soil conservation of this land is often expensive and difficult to apply and maintain. Quote one farmer who said, "Sure, I'm cropping Class IV land, but it's all I've got."

SUGGESTED ACTIVITIES

- Use Transparency #10 to illustrate your discussion.

26. Use Information Sheet, Section XXVII to discuss selecting the best land-capability class possible for certain soil factors.

    SUGGESTIONS:

    - Explain how the guide in Supplement #7 can be used in determining the major factors that can keep land out of Class I and in determining land-capability class.
    - Take students on a field trip to selected field sites and have them complete Assignment Sheet #2, a soil-classification worksheet.

      (NOTE: You may wish to follow the procedures in Assignment Sheet #4, Part II in selecting a field site.)

27. Use Information Sheet, Section XVIII to discuss the types of recommended land treatments applied to land-capability classes.

28. Use Information Sheet, Section XXIX to discuss types of vegetative practices and the land-capability class(es) each is applied to.

    SUGGESTION:

    - Point out that some vegetative practices apply to more than one land class.

29. Use Information Sheet, Section XXX to discuss mechanical treatments and their correct uses.

    SUGGESTIONS:

    - Point out that as a rule it is best to disregard practices and/or cover on the land being observed; however, there are exceptions to this rule. For example, when brush and trees cover Class I to Class VI land, it would be necessary to remove the brush, trees, and timber to reach the most-intensive use.
    - Point out that if terraces are needed and terraces are already on the land, you would still use the practices "terrace" and "farm on the contour."
    - Point out that if a cover of grass is on an area of Class V, VI, or VII land, you would still use the practice of establishing recommended grass or grasses and legumes, because what to one student is a "good stand of grass" could be considered a poor stand of grass to another.

SUGGESTED ACTIVITIES

30. Use Information Sheet, Section XXXI to discuss types of fertilizer applications and the soil types each is applied to.

    SUGGESTIONS:

    - Point out that the information presented in this section of the information sheet is not intended to make soil experts out of the students. Its purpose is to make students familiar with present-day terminology and to give them some knowledge of soil-fertility requirements. Emphasize that no set of limits with regard to lime or fertility requirements will begin to fit all areas of the country and all crops. Each has its own requirements.

    - Discuss the procedures in Assignment Sheet #3.

    - Take students to the same sites selected for Assignment Sheet #2 and have them complete a recommended land-treatment worksheet for each site.

31. Use Information Sheet, Section XXXII to discuss factors that may influence land-capability class and the correct land treatment applied to each.

    SUGGESTION:

    - Point out that the factors presented in the information sheet require extended study or information that will not be available from a single observation.

32. Use Assignment Sheet #4 to have students determine land-capability classes and select land treatments.

    SUGGESTIONS:

    - Select and prepare four fields to be judged. Determine conditions for each field.

    - Discuss Part I of the assignment sheet and have students complete in class.

    - Discuss Part II of the assignment sheet and then take students to the sites you have prepared to complete Part II.

    - Discuss with students the formation of a land-judging team to participate in various FFA contests.

H. Give test.

I. Critique test and discuss in class.

SUGGESTED ACTIVITIES

J. Reteach and retest as necessary.

K. Complete appropriate section of competency profiles.

III. Unit references

A. *America's Soil and Water: Condition and Trends.* Washington, D.C.: Soil Conservation Service/United States Department of Agriculture, 1980.

B. Braker, Pete. *Vocational Agriculture II,* rev. ed. Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1975.

C. *Conserving Soils.* Washington, D.C.: Soil Conservation Service, United States Department of Agriculture, n.d.

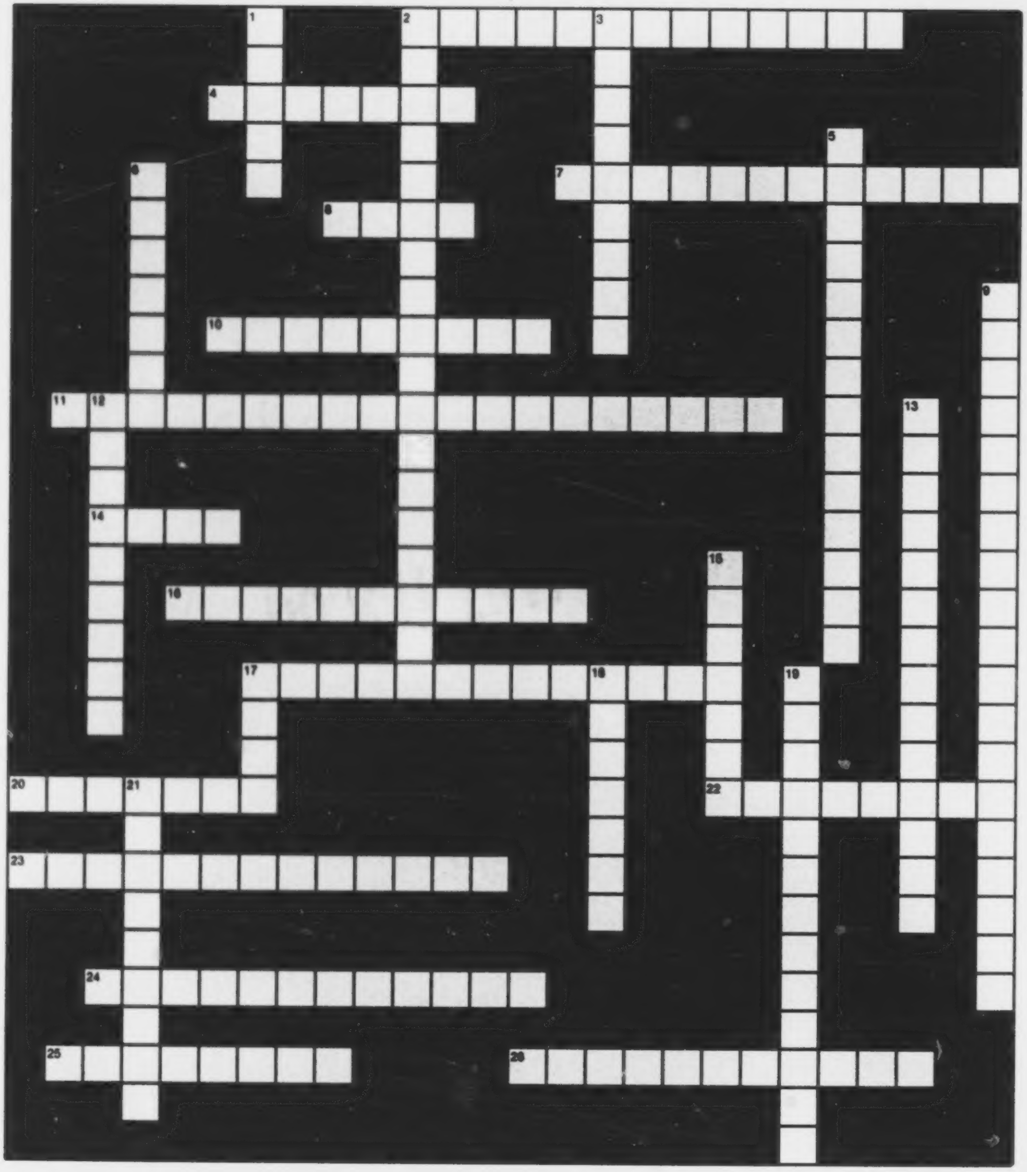
D. McCully, James S., Jr. *Lesson Plans for Teaching Basic Vocational Agriculture.* Jackson, Mississippi: State Department of Education/Division of Vocational-Technical Education, 1983.

E. Reeder, Dean. *Vocational Agriculture IV.* Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1973.

F. Stiegler, James H. *Land Judging in Oklahoma.* Stillwater, Oklahoma: Oklahoma State University Cooperative Extension Service, 1985.

SUGGESTED ACTIVITIES

SUPPLEMENT #1 — CROSSWORD PUZZLE: SELECTING CONSERVATION PRACTICES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SUPPLEMENT #1

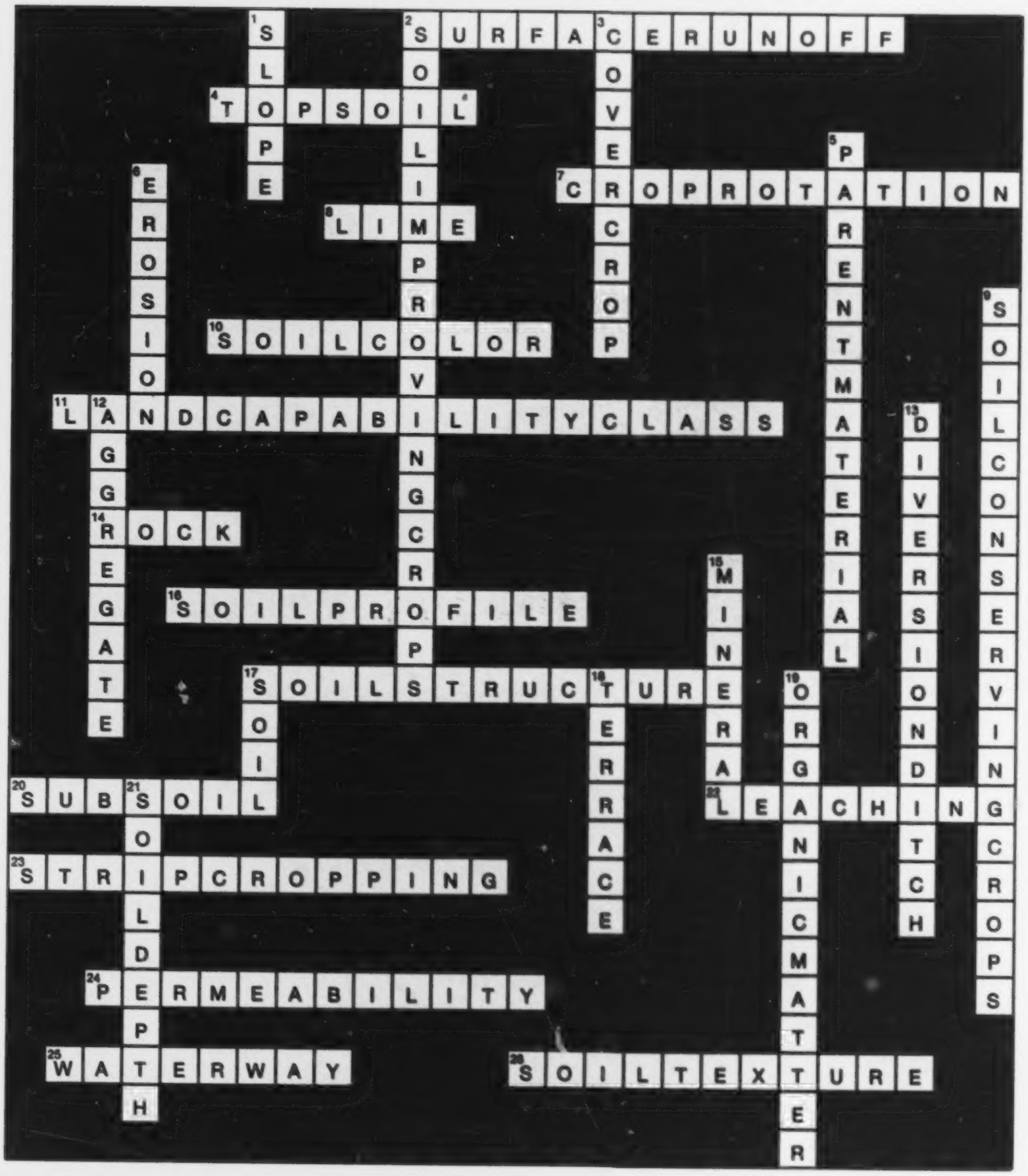
Across

2. Relative rate water is removed by flow over a soil's surface
4. Soil layer directly under our feet; A horizon zone in which seeds are planted and cultivated
7. Practice of growing different crops on a field chiefly to preserve the productive power of the soil
8. Calcareous material that neutralizes acidity and supplies calcium to the soil
10. Hue indicating the amount of organic matter, moisture, and texture of a soil
11. Classification of land according to its productive capacity and conservation treatment required to check erosion
14. More or less consolidated mass composed of two or more minerals
16. Side view or cross section of soil that allows all soil horizons to be examined
17. Shape and arrangement of soil particles into aggregates
20. Soil layer found just below the topsoil; B horizon zone and the storehouse for moisture and minerals
22. Process of removing nutrients from soil by the downward movement of water
23. Practice of growing separate crops in alternate strips running perpendicular to the slope of the land or to the direction of prevaling winds for the purpose of reducing erosion
24. The ease in which air and water are able to go down into a soil and return back toward the surface
25. Broad, grassy channel that carries water slowly and safely off a field
26. Proportion of sand, silt, and clay particles in a soil mass

Down

1. Number of feet of fall in each 100 feet
2. Crops used to improve or replenish, rather than deplete, soil's organic matter and to improve soil's structure and tilth
3. Crop used to cover the soil surface to decrease erosion
5. Unconsolidated mass of rock material from which the soil profile develops
6. Removal of soil by wind and/or water
9. Crops used to prevent or retard erosion
12. Single mass or cluster of soil particles
13. Ditch constructed to handle a large flow of water and to divert water around a field
15. General term for the inorganic elements in soil
17. Outer layer of the earth's crust capable of supporting plant growth; made up of mineral and organic matter
18. Embankment or ridge of earth constructed on the contour of a slope to control runoff and minimize erosion
19. General term for decomposing plant and animal material in or on the soil
21. Total thickness of the surface and subsoil plus any parent material that is favorable for root development

ANSWERS TO SUPPLEMENT #1


1 SLOPE
2 SURFACERUNOFF
2 SOILIMPROVINGCROP
3 COVERCROP
4 TOPSOIL
5 PARENTMATERIAL
6 EROSION
7 CROPROTATION
8 LIME
9 SOILCONSERVINGCROPS
10 SOILCOLOR
11 LANDCAPABILITYCLASS
12 AGGREGATE
13 DIVERSIONDITCH
14 ROCK
15 MINERAL
16 SOILPROFILE
17 SOILSTRUCTURE
17 SOIL
18 TERRACE
19 ORGANICMATTER
20 SUBSOIL
21 SOILDEPTH
22 LEACHING
23 STRIPCROPPING
24 PERMEABILITY
25 WATERWAY
26 SOILTEXTURE

SUGGESTED ACTIVITIES

SUPPLEMENT #2 — LAND USE — PAST AND PRESENT

Both now and in the past, people needed three things: food, water, and the materials to build shelter. The land and its soils have always provided these necessities. In the past, the way people lived was closely tied to the climate and the soils of the land on which they lived. For example, few of the Native Americans of the Plains States established farming villages because the climate and soils of the area made farming difficult. These people were not able to stay in one place and grow enough food, so they were forced to move from place to place, living in temporary camps and following their primary source of food and shelter — the buffalo. Today, our way of life is not as closely tied to the climate and the soil. We use technology and machines to alter the land to get the food, water, and materials we need — even from land that was formerly unable to supply them. In doing so, we have both helped and harmed the land.

The purpose of this supplement is to have you find out how the land you live on now was used in the past, how it is being used today, and how the land has been affected by its uses. In Part I, you will use encyclopedias, history books, or interviews to answer questions about how the land in your area was used in the past — specifically, how the Native Americans who lived in the area used the land. In Part II, you will use encyclopedias, interviews, or your personal experience to find out how the land is used today.

PART I: Land use in the past

Answer the following questions on the blanks provided, and use the back of the page if necessary.

A. Which Native Americans lived in your area? ______________________________

____

____

B. What types of food and shelter did these Native Americans use?

____

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C. How did these people get their food, water, and shelter? (Did they live in villages, or did they travel from place to place? Could they farm large areas for food?)

____

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SUPPLEMENT #2

PART II: Land use today

Answer the following questions on the blanks provided, and use the backs of the pages if necessary.

A. How is the land in your area used today?

B. What forms of technology are used on the land to support its present uses?

C. How has the use of technology helped the land?

D. How has the use of technology harmed the land?

SUPPLEMENT #2

E. Some scientists say that we should use less technology because technology used improperly can harm the land for many years. Other scientists say that we depend upon the use of technology to supply the goods we need and want, and therefore, we should use more technology. Which group do you think is correct? Why?

SUGGESTED ACTIVITIES

SUPPLEMENT #3 — USING MECHANICAL ANALYSIS TO DETERMINE A SOIL'S TEXTURAL CLASS

Soil scientists determine a soil's textural class by using a process called *mechanical analysis*, which measures the amounts of sand, silt, and clay in the soil. Several processes have been devised to make a mechanical analysis, but the basis on which all of these processes operate deals with the settling of soil particles in a liquid. In mechanical analysis, the soil is dried and pulverized, an exact amount of the soil is added to a container of water and Calgon (an agent that breaks the soil into individual particles), and then the container is shaken until all the soil particles are in suspension. Sand particles settle from suspension in approximately forty seconds. Silt particles settle from suspension in about one hour. By measuring the level of the particles that have settled in forty seconds and then again in one hour, scientists obtain the figures they need to calculate the percentages of sand, silt, and clay in the soil. Clay particles can remain in suspension for long periods of time; therefore, scientists do not wait to take this measurement.

In this assignment, you will take a soil sample, make a mechanical analysis of the soil, and then calculate the percentages of sand, silt, and clay in the soil. From these calculations, you will then use a table to determine the soil's textural-class name and make a visual representation of the textural class on a "Guide to Textural Classification."

I. Equipment and materials

  A. Soil sample

  B. 1-quart glass jar with lid

  (NOTE: The sides of the glass jar should be straight and level.)

  C. Measuring ruler or tape

  (NOTE: A metric ruler or tape is preferred.)

  D. Calgon solution

  (NOTE: Calgon can be purchased at any supermarket. The Calgon solution you use in the experiment should contain 6 tablespoons of Calgon per 1 quart of water.)

  E. Measuring cups and spoons

  F. Pencil and paper

II. Procedure

  A. Place approximately 1/2 cup of dry, pulverized soil into quart jar, and then tap jar gently to settle soil

  B. Measure depth of soil in jar

  (NOTE: You may find it easier to use the metric system and to make all the measurements in millimeters.)

Supplement #3 adapted from *Lesson Plans for Teaching Basic Vocational Agriculture,* "Section III, Introduction to Soil Management," as compiled by James S. McCully, Jr., from *Experiments in Soil Science,* by Logan S. Carter, California Vocational Education Productions. Used with permission of the Research and Curriculum Unit for Vocational-Technical Education, Mississippi State University, Jackson, Mississippi.

SUPPLEMENT #3

C. Add 5 tablespoons of Calgon solution and $3\frac{1}{2}$ cups of water to jar

D. Cap jar, and shake solution vigorously for five minutes

E. Place jar on a level surface and let it stand undisturbed for one minute

(NOTE: Do not disturb the jar during the waiting period.)

F. Measure the depth of the accumulated sand and record

G. Let jar stand undisturbed for one hour

(NOTE: Do not disturb the jar during the waiting period.)

H. Measure the depth of the accumulated silt and record

I. Calculate the percent of sand, silt, and clay in the soil by using the following formulas

$$\frac{\text{Depth of Sand Layer}}{\text{Original Depth of Soil}} \times 100 = \text{Percent of Sand}$$

$$\frac{\text{Depth of Silt Layer}}{\text{Original Depth of Soil}} \times 100 = \text{Percent of Silt}$$

100 Percent – (Percent of Sand + Percent of Silt) = Percent of Clay

EXAMPLE: If the original depth of the soil is 23 mm, the depth of the sand layer is 9 mm, and the depth of the silt layer is 10 mm, then

$$\frac{9 \text{ mm}}{23 \text{ mm}} \times 100 = 39\% = \text{Percent of Sand}$$

$$\frac{10 \text{ mm}}{23 \text{ mm}} \times 100 = 43\% = \text{Percent of Silt}$$

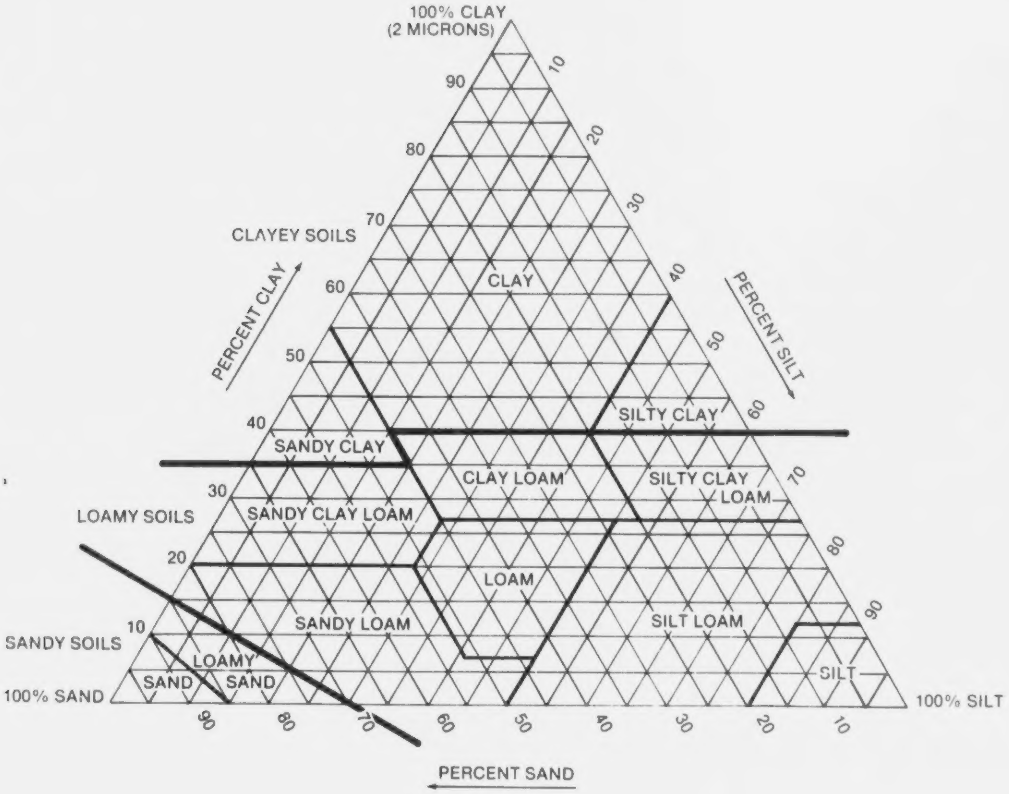
$100\% - (39\% + 43\%) =$
$100\% - 82\% = 18\% = $ Percent of Clay.

SUPPLEMENT #3

J. Make a visual representation of the textural class of your soil on the Guide for Textural Classification below.

(NOTE: The lines that run horizontally in the triangle represent the percentages of clay, the lines that slant to the left represent the percentages of sand, and the lines that slant to the right represent the percentages of silt.)

Guide for Textural Classification


100% CLAY
(2 MICRONS)
90
80
70
60
50
40
30
20
10
10
20
30
40
50
60
70
80
90
CLAYEY SOILS
PERCENT CLAY
PERCENT SILT
CLAY
SILTY CLAY
SANDY CLAY
CLAY LOAM
SILTY CLAY LOAM
LOAMY SOILS
SANDY CLAY LOAM
LOAM
SANDY LOAM
SILT LOAM
SANDY SOILS
LOAMY SAND
SAND
SILT
100% SAND
100% SILT
90
80
70
60
50
40
30
20
10
PERCENT SAND

Source: U.S. Department of Agriculture, Soil Conservation Service.

SUPPLEMENT #3

K. Use the following table to determine the textural class of your soil sample

Class name	Percentages of sand, silt, and clay in soil
Sand	80% to 100% sand
	0% to 5% clay and/or silt
Loamy sand	70% to 90% sand
	0% to 15% clay
	0% to 30% silt
Sandy loam	43% to 85% sand
	0% to 50% silt
	0% to 20% clay
Loam	23% to 52% sand
	28% to 50% silt
	7% to 27% clay
Silt-loam	20% to 45% sand
	15% to 53% silt
	27% to 40% clay
Silty clay-loam	20% to 45% sand
	15% to 53% silt
	27% to 40% clay
Sandy clay-loam	45% to 80% sand
	0% to 28% silt
	20% to 35% clay
Clay*	0% to 45% sand
	0% to 45% silt
	40% to 100% clay
Silt	0% to 20% sand
	0% to 12% clay
	87% to 100% silt

---

*Some clay soils may be classified as *silty clay* or *sandy clay*, depending upon the amounts of sand or silt present.

SUGGESTED ACTIVITIES

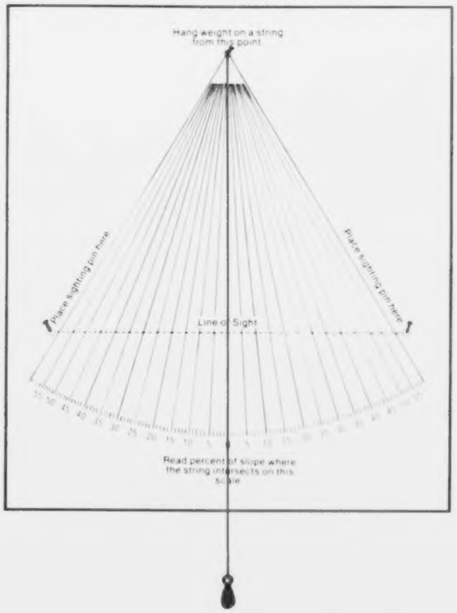
SUPPLEMENT #4 — CONSTRUCTING A SLOPE FINDER

I. Equipment and materials

- A. 1 piece of plywood that measures 8½′ × 11″
- B. 1 slope-finder chart (See Figure B at the end of this supplement)
- C. 1 string 12 inches long
- D. 3 small nails or brads
- E. 1 small weight
- F. Glue
- G. Transparent plastic wrap

II. Procedure

FIGURE A: Completed slope finder


Hang weight on a string from this point
Place sighting pin here
Place sighting pin here
Line of Sight
55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55
Read percent of slope where the string intersects on this scale

Supplement #4 adapted from *Lesson Plans for Teaching Basic Vocational Agriculture*, "Section III, Introduction to Soil Management," as compiled by James S. McCully, Jr., from *Experiments in Soil Science*, by Logan S. Carter, California Vocational Education Productions. Used with permission of the Research and Curriculum Unit for Vocational-Technical Education, Mississippi State University, Jackson, Mississippi.

SUPPLEMENT #4

A. Glue slope-finder chart to plywood

B. Cover mounted slope-finder chart with transparent plastic wrap

C. Drive nails or brads into circles marking sighting points on chart (See Figure A)

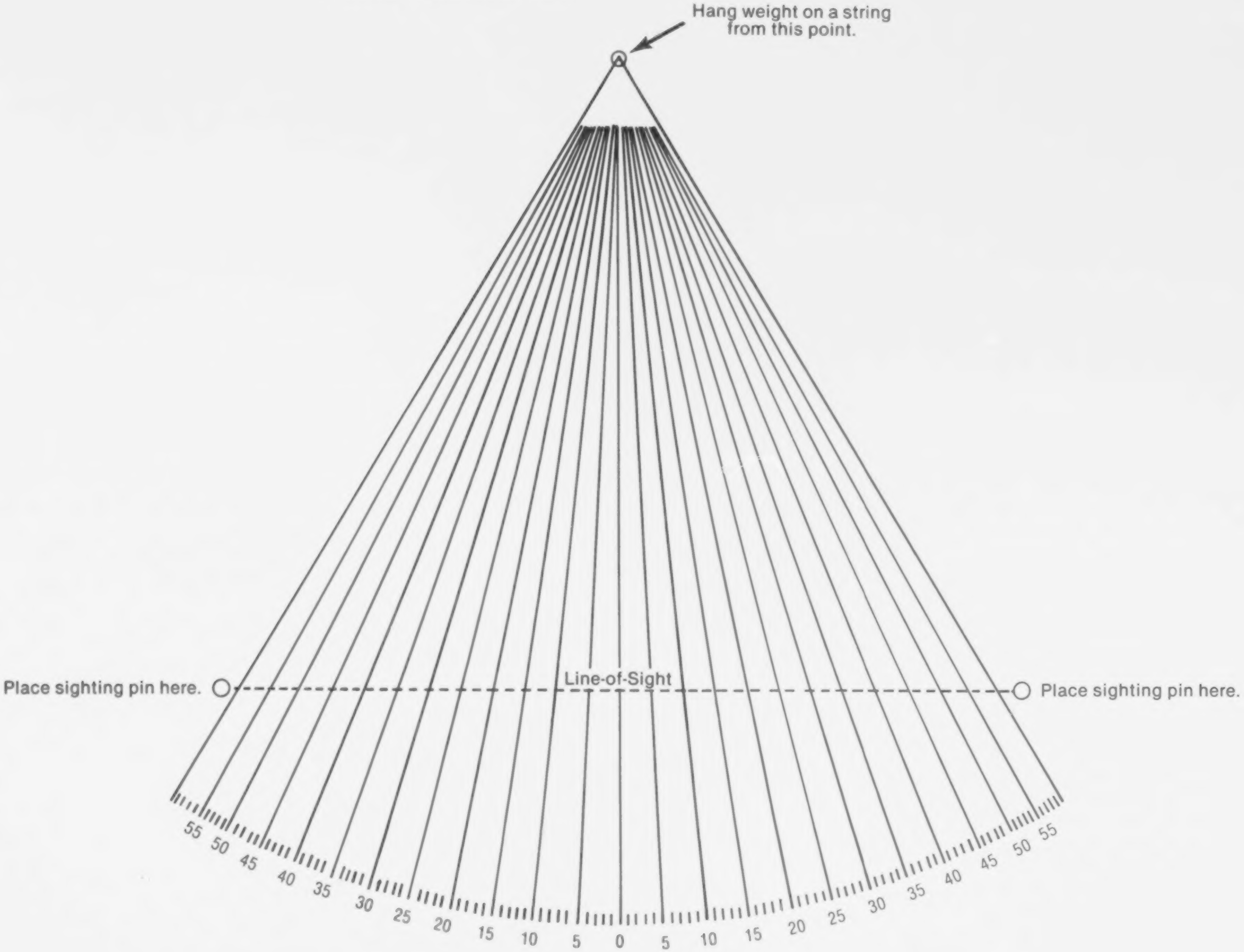
D. Tie a knot in end of string

E. Drive nail or brad through knot in end of string and into circle marking point of attachment on chart (See Figure A)

F. Hang a small weight from loose end of string (See Figure A)

SUPPLEMENT #4

FIGURE B: Slope-finder chart


Hang weight on a string from this point.

Place sighting pin here.

Place sighting pin here.

Read percent of slope where the string intersects on this scale.

Line-of-Sight
55
50
45
40
35
30
25
20
15
10
5
0
5
10
15
20
25
30
35
40
45
50
55

SUGGESTED ACTIVITIES

SUPPLEMENT #5 — WORD SEARCH: REASONS WHY WE NEED TO CONSERVE SOILS

The fifteen words shown in the following list are hidden in the word search below. Find all fifteen words and circle them. The words may run horizontally, vertically, or diagonally, but the letters of the words will always be in order. After you have found all fifteen words in the word search, use them to complete the sentences on the following page. Completed, these sentences will give you some reasons why it is important to conserve soils.

WILDLIFE
UGLY
SOIL EROSION
SCENERY
PRODUCTIVITY
POLLUTION
NUTRITIONAL
CONSERVATION
HUNGRY
NATURAL RESOURCES
FUTURE
FOOD
FARMLAND
FAMINE
EXPORT

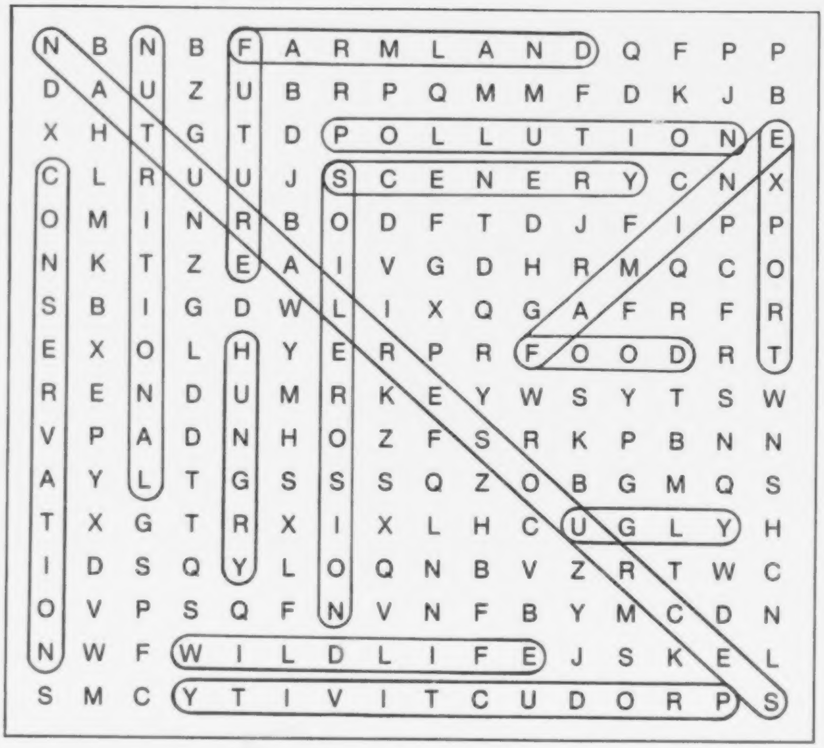
N	B	N	B	F	A	R	M	L	A	N	D	Q	F	P	P
D	A	U	Z	U	B	R	P	Q	M	M	F	D	K	J	B
X	H	T	G	T	D	P	O	L	L	U	T	I	O	N	E
C	L	R	U	U	J	S	C	E	N	E	R	Y	C	N	X
O	M	I	N	R	B	O	D	F	T	D	J	F	I	P	P
N	K	T	Z	E	A	I	V	G	D	H	R	M	Q	C	O
S	B	I	G	D	W	L	I	X	Q	G	A	F	R	F	R
E	X	O	L	H	Y	E	R	P	R	F	O	O	D	R	T
R	E	N	D	U	M	R	K	E	Y	W	S	Y	T	S	W
V	P	A	D	N	H	O	Z	F	S	R	K	P	B	N	N
A	Y	L	T	G	S	S	S	Q	Z	O	B	G	M	Q	S
T	X	G	T	R	X	I	X	L	H	C	U	G	L	Y	H
I	D	S	Q	Y	L	O	Q	N	B	V	Z	R	T	W	C
O	V	P	S	Q	F	N	V	N	F	B	Y	M	C	D	N
N	W	F	W	I	L	D	L	I	F	E	J	S	K	E	L
S	M	C	Y	T	I	V	I	T	C	U	D	O	R	P	S

SUPPLEMENT #5

1. Food is a major ______________________ that we sell to nations around the world.
2. Soils are one of our most valuable ______________________ ______________.
3. Severe soil erosion can lead to water ______________________.
4. Soil ______________________ must be kept high to produce all the food we eat.
5. People in many developing nations would be ______________________ without food aid from the United States.
6. Everyday, more and more ______________________ is lost to nonagricultural use.
7. Prosperous, productive farms provide us with beautiful ______________ as we travel along our nation's highways.
8. Food produced in the United States helps meet the ______________ needs of many people in developing nations.
9. ______________________ occurs when there are severe food shortages in an area.
10. Soil ______________________ is an important part of prosperous farming.
11. Mudslides, gullies, and muddy water are ______________ to look at.
12. Soil erosion can increase the price of the ______________ we eat.
13. More than fifty years after the Dust Bowl, ______________________ ______________ is still a national challenge.
14. Windbreaks and other soil-conservation practices create homes for birds, rabbits, foxes, and other kinds of ______________________.
15. The ______________________ depends upon productive soils.

SUPPLEMENT #5

Answers to the word search



N	B	N	B	F	A	R	M	L	A	N	D	Q	F	P	P
D	A	U	Z	U	B	R	P	Q	M	M	F	D	K	J	B
X	H	T	G	T	D	P	O	L	L	U	T	I	O	N	E
C	L	R	U	U	J	S	C	E	N	E	R	Y	C	N	X
O	M	I	N	R	B	O	D	F	T	D	J	F	I	P	P
N	K	T	Z	E	A	I	V	G	D	H	R	M	Q	C	O
S	B	I	G	D	W	L	I	X	Q	G	A	F	R	F	R
E	X	O	L	H	Y	E	R	P	R	F	O	O	D	R	T
R	E	N	D	U	M	R	K	E	Y	W	S	Y	T	S	W
V	P	A	D	N	H	O	Z	F	S	R	K	P	B	N	N
A	Y	L	T	G	S	S	S	Q	Z	O	B	G	M	Q	S
T	X	G	T	R	X	I	X	L	H	C	U	G	L	Y	H
I	D	S	Q	Y	L	O	Q	N	B	V	Z	R	T	W	C
O	V	P	S	Q	F	N	V	N	F	B	Y	M	C	D	N
N	W	F	W	I	L	D	L	I	F	E	J	S	K	E	L
S	M	C	Y	T	I	V	I	T	C	U	D	O	R	P	S

Answers to complete the sentences

1. Export
2. National resources
3. Pollution
4. Productivity
5. Hungry
6. Farmland
7. Scenery
8. Nutritional
9. Famine
10. Conservation
11. Ugly
12. Food
13. Soil erosion
14. Wildlife
15. Future

SUGGESTED ACTIVITIES

SUPPLEMENT #6 — DEMONSTRATING THE EFFECTIVENESS OF TWO SOIL-CONSERVATION PRACTICES

The purpose of this experiment is to demonstrate the effectiveness of planting cover crops and making terraces. After completing the experiment, record your findings on the following page.

I. Equipment and materials

  A. 3 boxes that measure 4″ × 12″ × 18″

  (NOTE: Boxes may consist of three separate boxes or one box with three compartments as shown in Figure A.)

  B. 3 glass jars

  (NOTE: Pint jars work best.)

  C. Soil

  D. Sprinkling can and water

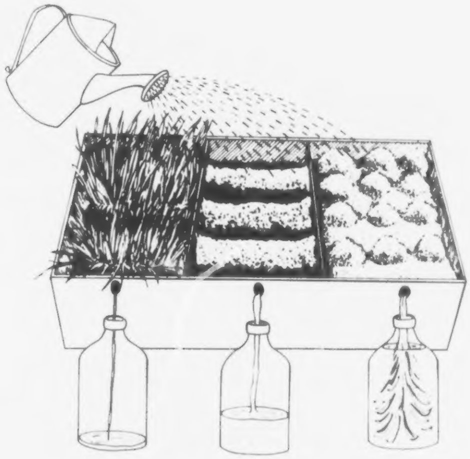
  E. Measuring cups

  F. Pen or pencil

  G. Ruler

II. Procedure

FIGURE A



SUPPLEMENT #6

A. Construct boxes with drain holes, and arrange glass jars as shown in Figure A

B. Measure and add the same amount of soil to each box

C. Add cover crop to one box and terraces to another, but leave the soil in one box level and with no cover (See Figure A)

D. Raise one end of each box to create equal slopes in the boxes

E. Measure water into a sprinkling can, and use sprinkling can to "make it rain" equal amounts over each box (See Figure A)

F. Leave boxes undisturbed for a period of time, and then measure the amount of water that collects in each glass jar

G. Record the results of your experiment on the blanks below

SUGGESTED ACTIVITIES

SUPPLEMENT #7 — GUIDE TO DETERMINING LAND-CAPABILITY CLASS AND LAND-TREATMENT PRACTICES

In order to ensure uniformity in teaching land judging in Oklahoma, Oklahoma State University's Cooperative Extension Service developed *Land Judging in Oklahoma*, a booklet of tables and notes summarizing the various combinations of soil, texture, permeability, depth, slope, erosion, runoff, wetness, and flooding that could affect land-capability class. Applicable treatments are also shown. The tables and notes from the 1985 edition of the booklet are reprinted here for your convenience*. Be sure to study the table of abbreviations below and to read the general notes that go with each soil-texture table and the special notes that appear at the end of this supplement.

TABLE A: Abbreviations used in soil-texture tables

Abbreviation	Definition
VS	Very slowly permeable or very slow surface runoff
S	Slow permeability or slow surface runoff
M	Moderately permeable, moderate erosion, or moderate surface runoff
R	Rapid permeability or rapid runoff
N	None to slight erosion
Sev	Severe erosion
V Sev	Very severe erosion
NL	Nearly level
GS	Gently sloping
MS	Moderately sloping
Str	Strongly sloping
Steep	Steep slopes
V Steep	Very steep slopes

Land Judging in Oklahoma is updated yearly. Be sure to use the information in the most current issue as your guide.

The tables in Supplement #7 are used with permission of the Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma, from *Land Judging in Oklahoma*, by James H. Stiegler, 1985.

SUPPLEMENT #7

GENERAL NOTES: Coarse-textured soils — deep and moderately deep

1. Coarse surface-soil texture is a major factor keeping the soil out of Class I.
2. The best land-capability class for coarse-textured soils is III.
3. Slopes from 1 to 3 percent will be checked as a major factor but will not lower the land-capability class.
4. Moderate erosion will be checked as a major factor but will not lower the land-capability class.
5. Either very slow or rapid surface runoff will be checked as a major factor, except where soils are rapidly permeable. These checked factors will not lower the land-capability class.
6. Rapid permeability will be checked as a major factor but will not lower the land-capability class. In actual practice, rapid permeability would require a subclass separation for treatment differences, but subclasses are not considered in this contest.
7. In combination with texture, slopes over 3 percent and severe or very severe erosion are major factors that lower the land-capability class from III or IV to VI.
8. The best land-capability class for coarse-textured soils on slopes of less than 3 percent with severe or very severe erosion is Class VI.
9. The best land-capability class for coarse-textured soils on moderately sloping or strongly sloping soils is Class IV.
10. The best land-capability class for coarse-textured soils on moderately sloping or strongly sloping soils with severe or very severe erosion is Class VI.
11. The best land-capability class for coarse-textured soils on steep or very steep slopes is Class VI.
12. The best land-capability class for coarse-textured soils that are rarely flooded is Class III. This condition will be given and the flooding will be checked as a major factor, but it will not lower the land-capability class.
13. Flooding is not considered on slopes over 1 percent.
14. Shallow or very shallow coarse-textured soils will not be used in contests.
15. Of the mechanical practices, only 14, 19, or 20 will be used.

TABLE B: Coarse-textured soils — deep and moderately deep

Slope	Erosion	Permeability	Surface runoff	Capability class	Factors that keep land out of Class I	Vegetative treatment	Possible mechanical treatment* (Use one or more.)
NL	N	S	S	III	1	3,5,6	14,20
NL	M	S	S	III	1,4	3,5,6	14,20
NL	Sev & V Sev	S	S	VI	1,4	7,8,9,10	14,19,20
GS	N	S	M	III	1,3	3,5,6	14,20
GS	M	S	M	III	1,3,4	3,5,6	14,20
GS	Sev & V Sev	S	M	VI	1,3,4	7,8,9,10	14,19,20
NL	N	M	VS	III	1,6	3,5,6	14,20

*See "Special Notes" on last page of supplement.

SUPPLEMENT #7

TABLE B (Continued)

Slope	Erosion	Permeability	Surface runoff	Capability class	Factors that keep land out of Class I	Vegetative treatment	Possible mechanical treatment* (Use one or more.)
NL	M	M	VS	III	1,4,6	3,5,6	14,20
NL	Sev & V Sev	M	VS	VI	1,4,6	7,8,9,10	14,19,20
GS	N	M	M	III	1,3	3,5,6	14,20
GS	M	M	M	III	1,3,4	3,5,6	14,20
GS	Sev & V Sev	M	M	VI	1,3,4	7,8,9,10	14,19,20
MS	N	M	R	IV	1,3,6	4,5,6	14,20
MS	M	M	R	IV	1,3,4,6	4,5,6	14,20
MS	Sev & V Sev	M	R	VI	1,3,4,6	7,8,9,10	14,29,20
Str	N	M	R	IV	1,3,6	4,5,6	14,20
Str	M	M	R	IV	1,3,4,6	4,5,6	14,19,20
Str	Sev & V Sev	M	R	VI	1,3,4,6	7,8,9,10	14,19,20
Steep V Steep	All	M	R	VI	1,3,6, also 4 if eroded	7,8,9,10	14,19,20
NL	N	R	VS	III	1,5	3,5,6	14,20
NL	M	R	VS	III	1,4,5	3,5,6	14,20
NL	Sev & V Sev	R	VS	VI	1,4,5	7,8,9,10	14,19,20
GS	N	R	VS	III	1,3,5	3,5,6	14,20
GS	M	R	VS	III	1,3,4,5	3,5,6	14,20
GS	Sev & V Sev	R	VS	VI	1,3,4,5	7,8,9,10	14,19,20
MS	N	R	VS	IV	1,3,5	4,5,6	14,20
MS	M	R	VS	IV	1,3,4,5	4,5,6	14,20
MS	Sev & V Sev	R	VS	VI	1,3,4,5	7,8,9,10	14,19,20
Str	N	R	VS	IV	1,3,5	4,5,6	14,20
Str	M	R	VS	IV	1,3,4,5	4,5,6	14,20
Str	Sev & V Sev	R	VS	VI	1,3,4,5	7,8,9,10	14,19,20
Steep V Steep	All	R	All	VI	1,3,5 also 4 if eroded	7,8,9,10	14,19

*See "Special Notes" on last page of supplement.

SUPPLEMENT #7

GENERAL NOTES: Moderately coarse-, medium-, moderately fine-, and fine-textured soils — deep and moderately deep

1. Surface-soil texture is not a major factor.
2. The best land-capability class for moderately coarse, medium, moderately fine, and fine soils is Class I.
3. Any slope of less than 1 percent is not a major factor.
4. Any slope over 1 percent is a major factor, and it will lower the land-capability class.
5. Very slow permeability is a major factor, and it will lower the land-capability class by one unit.
6. Very slow surface runoff is a major factor, and it will lower the land-capability by one unit.
7. Rapid surface runoff is a major factor, but it will not lower the land-capability class.
8. None to slight erosion is not a major factor.
9. Moderate erosion is a major factor that will lower the land-capability class on 0 to 1 and 1 to 3 percent slopes.
10. Moderate erosion will be checked as a major factor on slopes over 3 percent, but it will not lower the land-capability class.
11. The best land-capability class for moderately coarse, medium, moderately fine, and fine soils on 0 to 1 percent slope that is moderately wet is Class II. Wet soils can be no better than Class V. These degrees of wetness will be given and wetness will be checked as a major factor and will lower the land-capability class.
12. On very slowly permeable, nearly level soils, moderate erosion occasionally does occur. However, because of the difficulty involved in explaining and defining specific treatment for such a condition, that type of soil will not be used in a contest.

TABLE C: Moderately coarse-, medium-, moderately fine-, and fine-textured soils — deep and moderately deep

Slope	Erosion	Permeability	Surface runoff	Capability class	Factors that keep land out of Class I	Vegetative treatment	Possible mechanical treatment* (Use one or more.)
NL	N	VS	S	II	5	2,5,6	14,20
NL	N	VS	VS	III	5,6	3,5,6	14,18,20
GS	N	VS	M	III	3,5	3,5,6	14,15,16
GS	M	VS	M	IV	3,4,5	4,5,6	14,15,16
GS	Sev & V Sev	VS	M	VI	3,4,5	7,8,9,10	14,19,20
MS	N	VS	R	IV	3,5,6	4,5,6	14,15,16
MS	M	VS	R	IV	3,4,5,6	4,5,6	14,15,16
MS	Sev & V Sev	VS	R	VI	3,4,5,6	7,8,9,10	14,19,20
Str	N	VS	R	VI	3,5,6	7,8,9,10	14,20
Str	M, Sev, & V Sev	VS	R	VI	3,4,5,6	7,8,9,10	14,19,20

*See "Special Notes" on last page of supplement.

SUPPLEMENT #7

TABLE C (Continued)

Slope	Erosion	Permeability	Surface runoff	Capability class	Factors that keep land out of Class I	Vegetative treatment	Possible mechanical treatment* (Use one or more.)
Steep V Steep	M, Sev, &V Sev	VS	R	VII	3,4,5,6	7,8,9,10	14,19,20
NL	N	S & M	S	I	9	1,5,6	14,20
NL	N	S & M	VS	II	6	2,5,6	14,20
NL	M	S & M	S	II	4	2,5,6	14,20
GS	N	S & M	M	II	3	2,5,6	14,15,16
GS	M	S & M	M	III	3,4	3,5,6	14,15,16
GS	Sev & V Sev	S & M	M	VI	3,4	7,8,9,10	14,19,20
MS	N	S & M	R	III	3,6	3,5,6	14,15,16
MS	M	S & M	R	III	3,4,6	3,5,6	14,15,16
MS	Sev & V Sev	S & M	R	VI	3,4,6	7,8,9,10	14,19,20
Str	N	S & M	R	IV	3,6	4,5,6	14,15,16
Str	M	S & M	R	IV	3,4,6	4,5,6	14,15,16
Str	Sev & V Sev	S & M	R	VI	3,4,6	7,8,9,10	14,19,20
Steep V Steep	N	S & M	R	VI	3,6	7,8,9,10	14,20
Steep V Steep	M	S & M	R	VI	3,4,6	7,8,9,10	14,19,20
Steep V Steep	Sev & V Sev	S & M	R	VI	3,4,6	7,8,9,10	14,19,20

*See "Special Notes" on last page of supplement.

GENERAL NOTES: Moderately coarse-, medium-, moderately fine-, and fine-textured soils — shallow

1. Surface-soil texture is not a major factor.
2. The best land-capability class for shallow loamy and clayey soils is Class III.
3. Depth is a major factor, and the best land-capability class is Class III.
4. Any slope of less than 1 percent is not a major factor.
5. Any slope of 1 to 3 percent will be checked as a major factor but will not lower the land-capability class.

SUPPLEMENT #7

6. Any slope over 3 percent is a major factor and will lower the land capability one class.
7. None to slight erosion is not a major factor.
8. Moderate erosion is a major factor that will lower the land-capability class on 0 to 1 and 1 to 3 percent slope.
9. Moderate and severe erosion will be checked as a major factor on slopes of 3 to 5 percent but will not lower the land-capability class.
10. Very severe erosion is a major factor and will lower the land-capability class.
11. Very slow permeability will be checked as a major factor, but it will not lower the land-capability class.
12. Very slow runoff or rapid runoff will be checked as a major factor, but neither will lower the land-capability class.
13. Mechanical practices 15 and 16 are not used on slopes of less than 1 percent, even if the land-capability class is Class III.

TABLE D: Moderately coarse-, medium-, moderately fine-, and fine-textured soils — shallow

Slope	Erosion	Permeability	Surface runoff	Capability class	Factors that keep land out of Class I	Vegetative treatment	Possible mechanical treatment* (Use one or more.)
NL	N	All Conditions	S	III	2	3,5,6	14,20
NL	M		S	IV	2,4	4,5,6	14,15,16
GS	N		M	III	2,3	3,5,6	14,15,16
GS	M		M	IV	2,3,4	4,5,6	14,15,16
MS	N		R	IV	2,3,4	4,5,6	14,15,16
MS	M		R	IV	2,3,4	4,5,6	14,15,16
Str Steep & V Steep	N, M, & Sev		R	VI	2,3,6 also 4 if eroded	7,8,9,10	14,19,20
Str Steep & V Steep	V Sev		R	VII	2,3,4,6	7,8,9,10	14,19

*See "Special Notes" on last page of supplement.

SUPPLEMENT #7

TABLE E: Moderately coarse-, medium-, moderately fine-, and fine-textured soils — very shallow

Slope	Erosion	Permeability	Surface runoff	Capability class	Factors *that keep* land out of Class I	Vegetative treatment	Possible mechanical *treatment** (Use one or more.)
All	All	All	All	VII	5 if VS 2 in all cases 3 if sloping 4 if eroded 6 if rapid runoff	7,8,9,10	14,19,20

*See "Special Notes."

TABLE F: Special factors (conditions) — deep soils

Slope	Erosion	Permeability	Other factors	Capability class	Factors that keep land out of Class I	Vegetative treatment	Possible mechanical treatment* (Use one or more.)
All	All	All	Mod Wet	II	7	2,5,6	14,18
All	All	All	Wet	V	7	7,8,9,10	14
All	All	All	Flooding	V	8	7,8,9,10	14,20

*See "Special Notes."

SPECIAL NOTES: Possible mechanical treatments

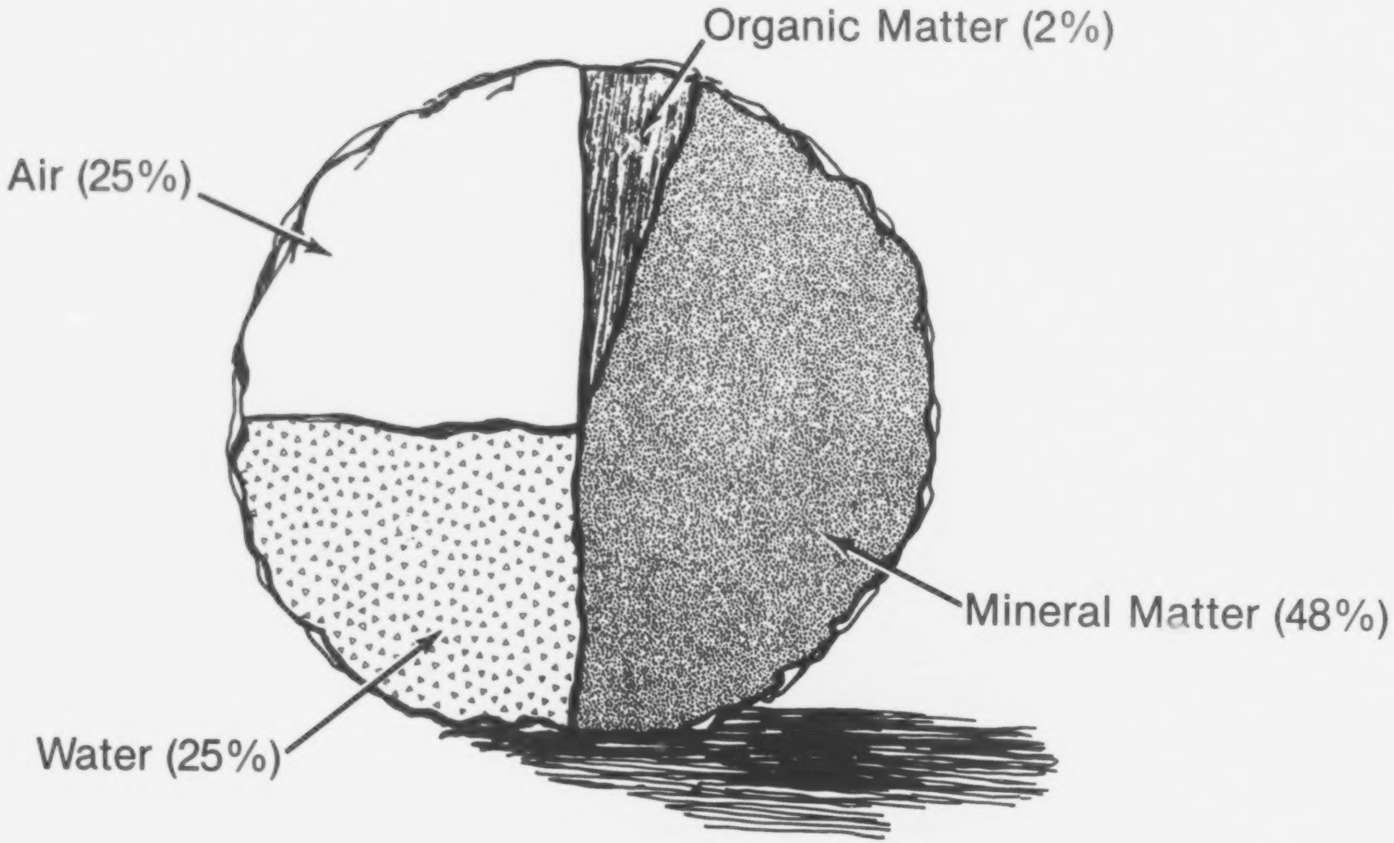
Possible mechanical treatments cannot be specific in all cases. It is the job of the contestants to pick out the treatments that apply. For example, a field can be found that would need *no* mechanical treatment for the most intensive use; therefore, practice *20* would be shown. A similar field in relation to soil, slope, and erosion could be covered with undesirable brush and trees and, therefore, would need practice *14*. Should a field also be gullied, practices *14* and *19* would be used. Depending on soil, slope, cover, erosion, and most intensive use, practices 14, 15, 16 or 15, and 16 could be the correct answer. Class I land in grass or cultivation would require practice 20. The same class of land but covered by brush and trees would require practice 14. In other words, any field will need to have checked *one* or *more* of the possible mechanical practices that are shown under the column of *Possible Mechanical Treatment.*

SPECIAL NOTES: Other factors

"Other factors" shown on the condition sheet will be a key to treatment needs. These treatments are not shown under mechanical treatments. When conditions warrant, these will be noted on the condition sheet with other given information. The contestant will need to check the appropriate condition on the score card.

ALL EXPLANATIONS GIVEN IN THIS BROCHURE ARE FOR TEACHING AND UNDERSTANDING. BECAUSE OF THE POSSIBILITY OF OVERLOOKING A DIFFERENCE BETWEEN THE NARRATIVES AND THE TABLES, THE TABLES WILL BE THE FINAL WORD IN CONTEST SITUATIONS.

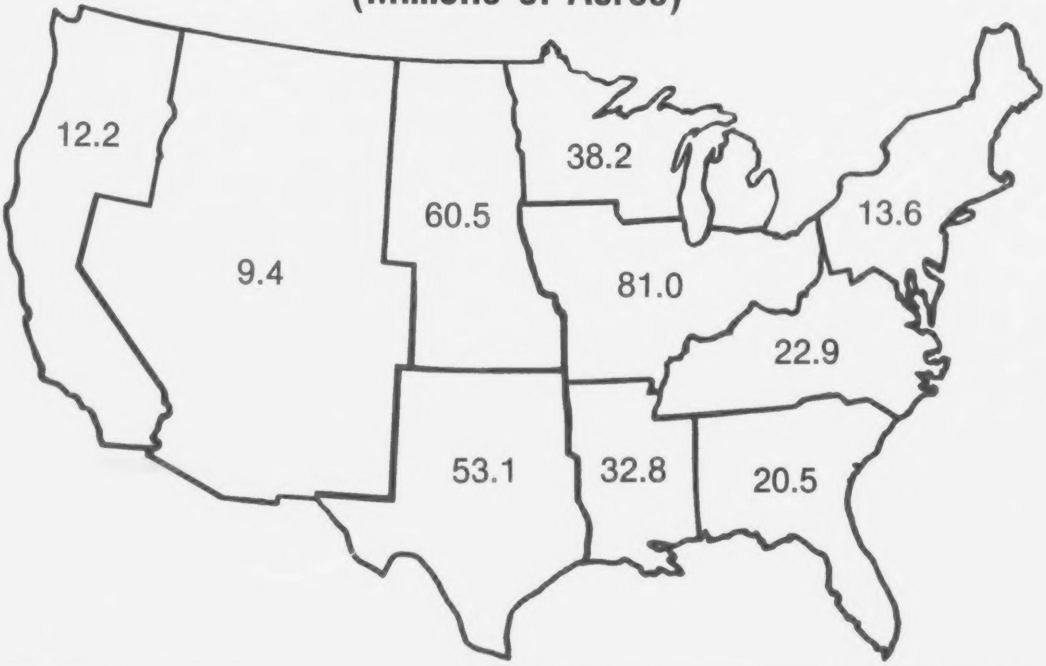
Composition of an Average Soil



TM #1

Acres of Prime Farmland in Each Farm-Production Region of the United States

(Millions of Acres)



Pacific	12.2	Corn Belt	81.0
Mountain	9.4	Delta States	32.8
Northern Plains	60.5	Northeast	13.6
Southern Plains	53.1	Appalachian	22.9
Lake States	38.2	Southeast	20.5

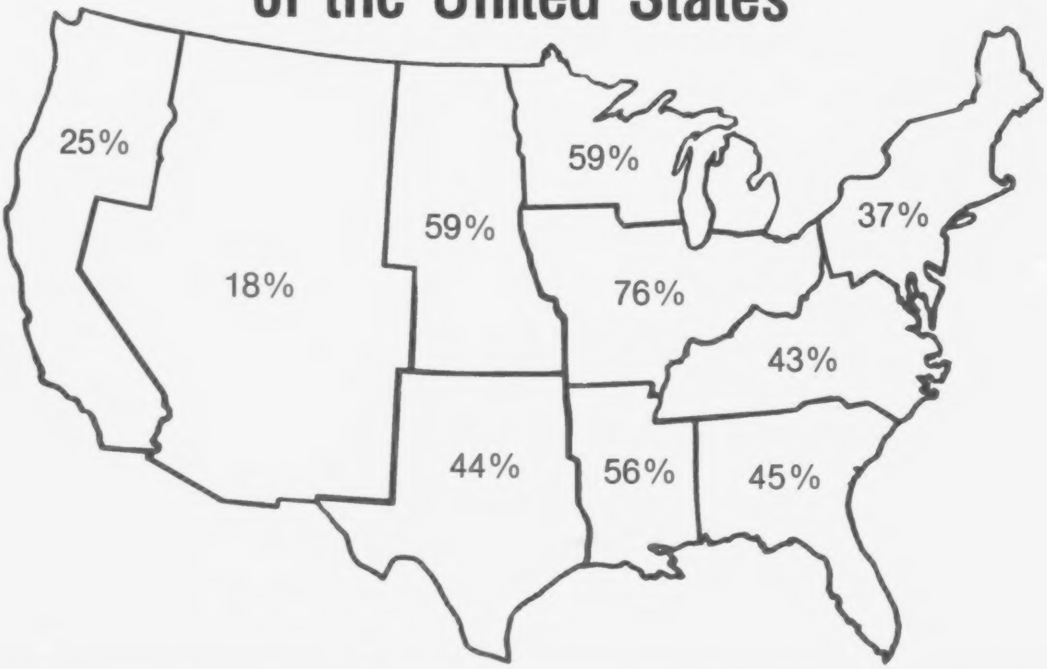
Source: *America's Soil and Water: Conditions and Trends*, United States Department of Agriculture, December, 1980.

Use of Prime Farmland in the United States

Land use	Acres (Millions)	Percent
Cropland	230	67
Native pasture and pastureland	40	12
Rangeland	22	6
Forest land	42	12
Other land	11	3
Total	345	100

Source: *America's Soil and Water: Conditions and Trends*, United States Department of Agriculture, December, 1980.

Percent of Good Cropland in Each Farm-Production Region of the United States

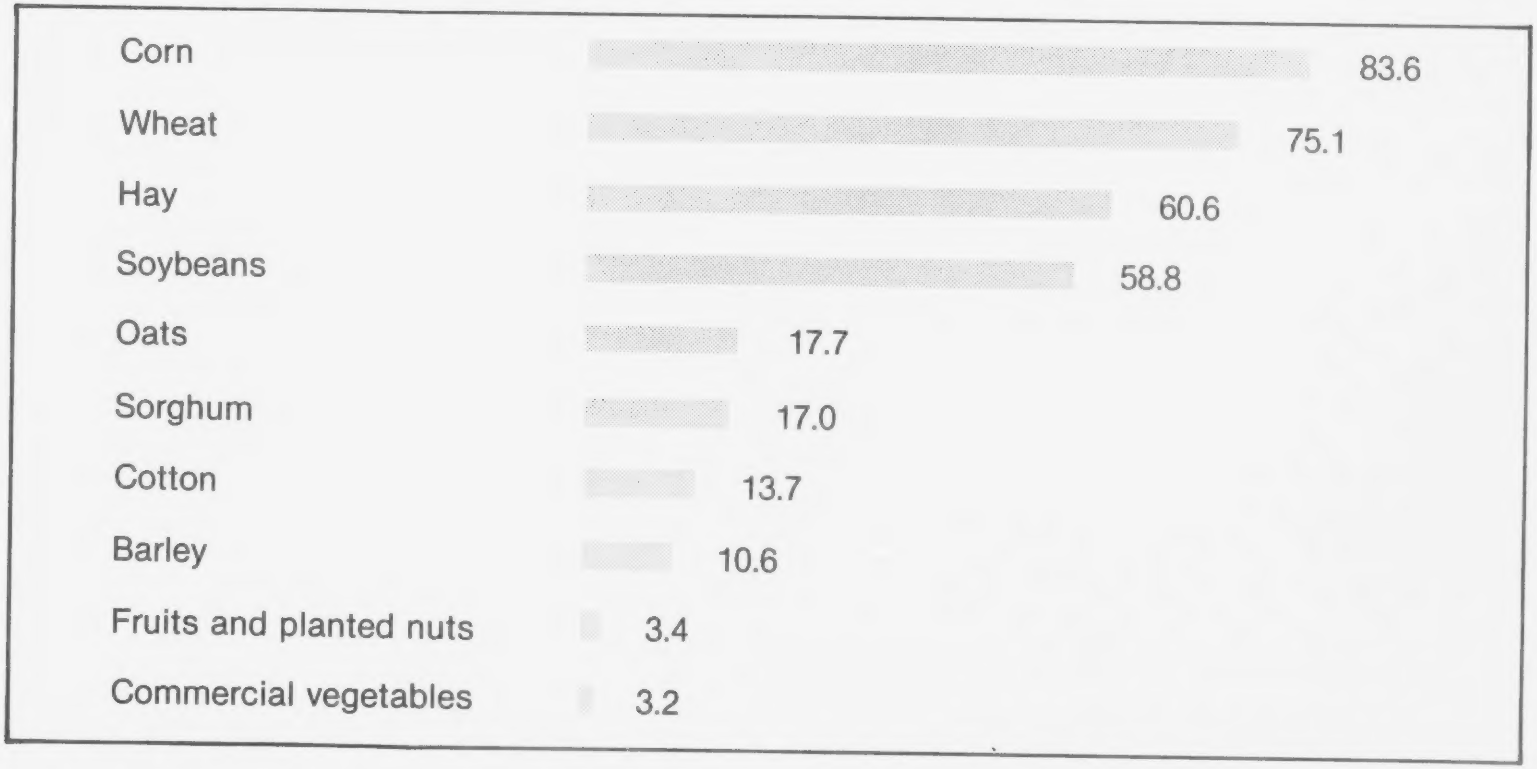


Pacific	25%	Corn Belt	76%
Mountain	18%	Delta States	56%
Northern Plains	59%	Northeast	37%
Southern Plains	44%	Appalachian	43%
Lake States	59%	Southeast	45%

Source: *America's Soil and Water: Conditions and Trends*, United States Department of Agriculture, December, 1980.

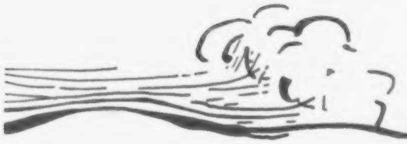
Important Crops Grown in the United States

(Millions of Acres Planted in 1977)

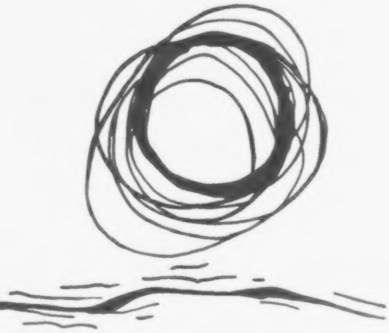


Source: *America's Soil and Water: Conditions and Trends*, United States Department of Agriculture, December, 1980.

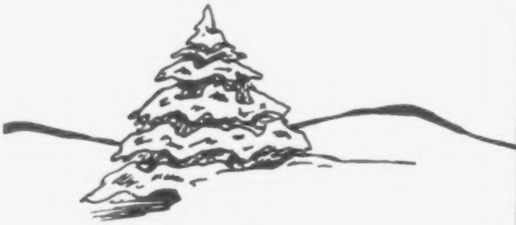
Types of Physical Weathering



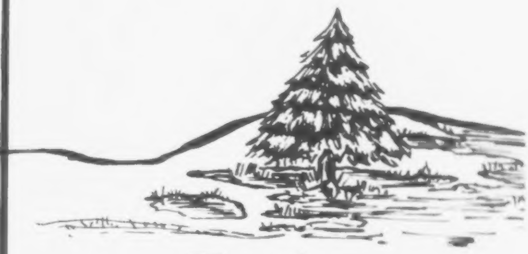
Wind



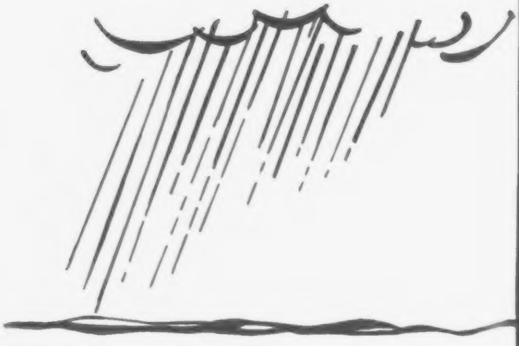
Heating and Cooling



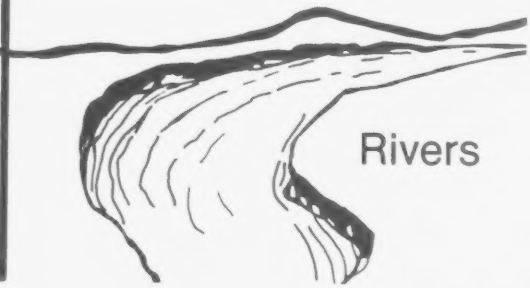
Freezing



Thawing

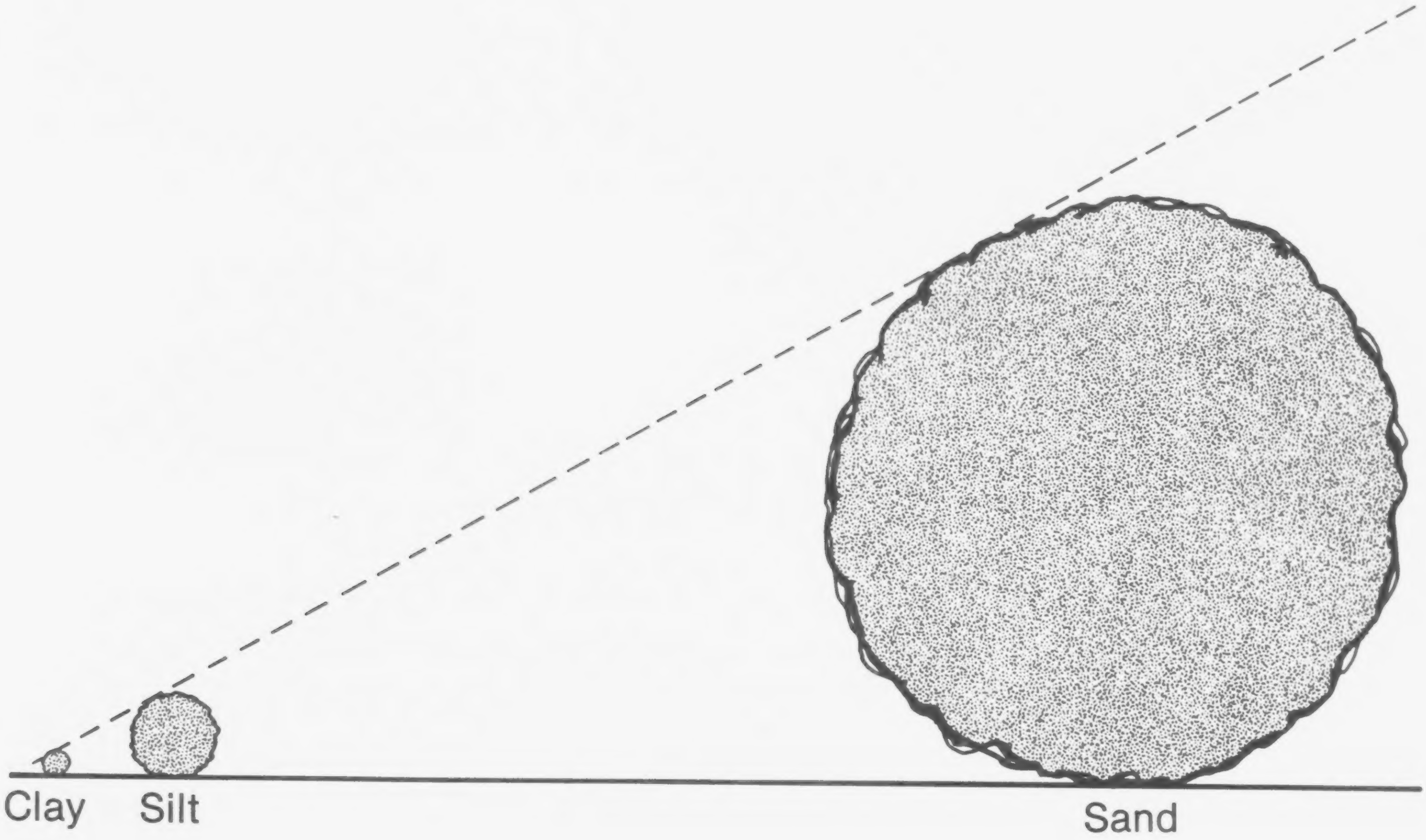


Wetting and Drying



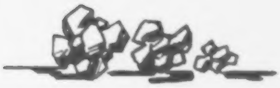
Rivers

Soil-Particle Groups Classified According to Size

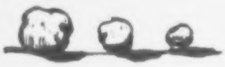

Clay
Silt
Sand

Kinds of Soil Structures

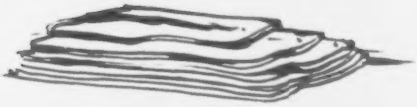
Crumb



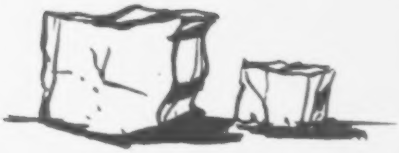
Granular



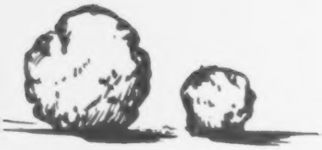
Platy



Blocky

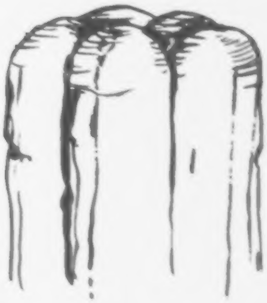


Angular Blocky

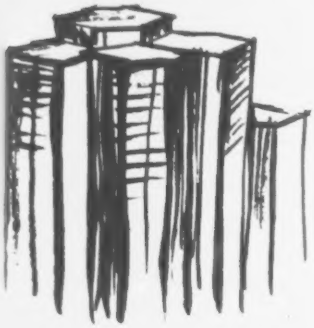


Round (Subangular) Blocky

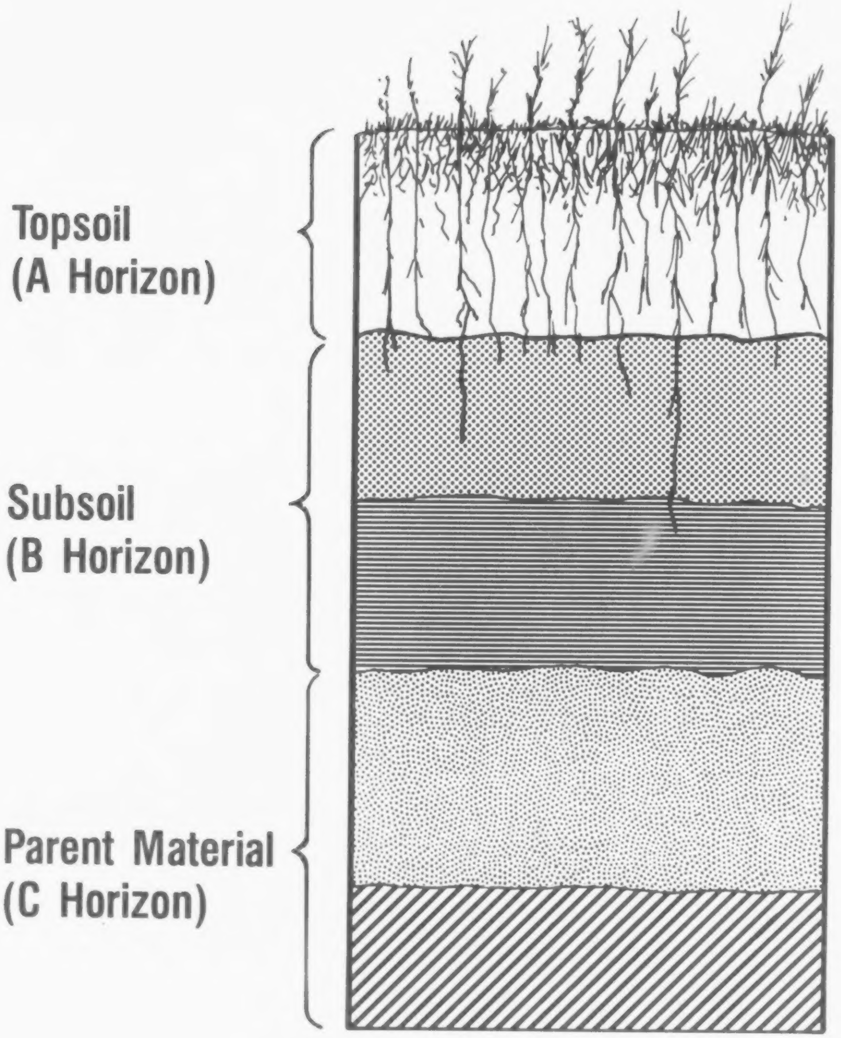
Columnar



Prismatic

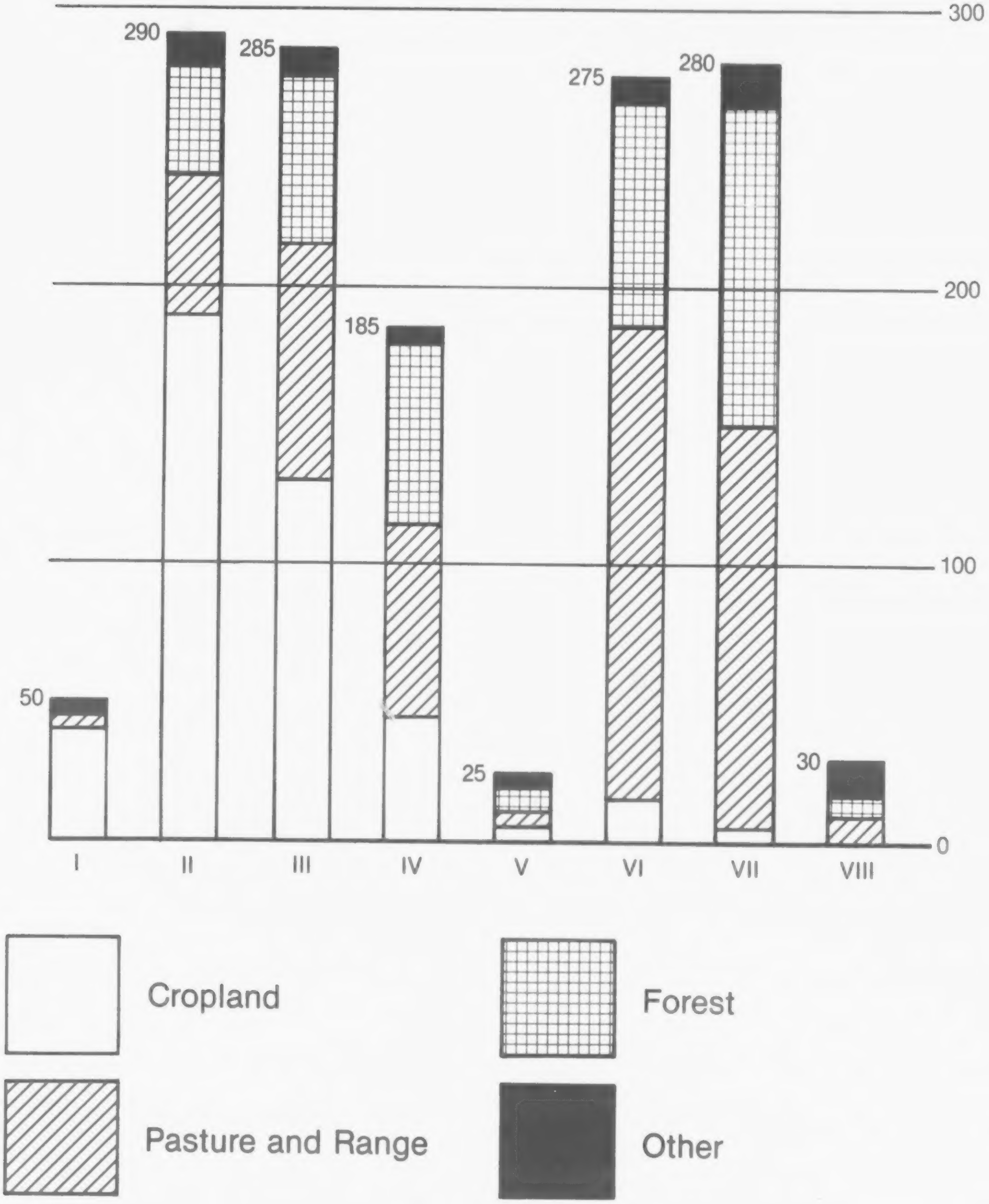


Soil Profile


Topsoil
(A Horizon)
Subsoil
(B Horizon)
Parent Material
(C Horizon)

Land Use by Land-Capability Class

(Estimated in Millions of Acres)



Source of information contained in chart: *America's Soil and Water: Conditions and Trends*, United States Department of Agriculture, December, 1980.

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

INFORMATION SHEET

I. Terms and definitions associated with selecting soil-conservation practices

   A. Mineral — General term for inorganic elements in soil

      EXAMPLES: Nitrogen, phosphorus (phosphate), potassium (potash)

   B. Organic matter — General term for decomposing plant and animal material in or on soil

   C. Soil formation — Development of soil from parent material

   D. Rock — More or less consolidated mass composed of two or more minerals

   E. Parent material — Unconsolidated mass of rock material from which the soil profile develops

   F. Leaching — Process of removing nutrients from soil by the downward movement of water

   G. Soil profile — Side view or cross section of soil that allows all soil horizons to be examined

   H. Soil texture — Proportion of sand, silt, and clay particles in a soil mass

   I. Friable — Easily crumbled, pulverized, or reduced to powder

   J. Soil structure — Shape and arrangement of soil particles into aggregates

   K. Aggregate — Single mass or cluster of soil particles

      EXAMPLES: Clod, crumb, granule

   L. Soil color — Hue indicating the amount of organic matter, moisture, and texture of a soil

   M. Erosion — Removal of soil by wind and/or water

   N. Waterway — Broad, grassy channel that carries water slowly and safely off a field

   O. Terrace — Embankment or ridge of earth constructed on the contour of a slope to control runoff and minimize erosion

   P. Crop rotation — Practice of growing different crops on a field chiefly to preserve the productive power of the soil

INFORMATION SHEET

Q. Strip-cropping — Practice of growing separate crops in alternate strips running perpendicular to the slope of the land or to the direction of prevailing winds for the purpose of reducing erosion

R. Diversion terrace — Channel with a supporting ridge on the lower side; usually constructed to handle a large flow of water and to divert water around a field

S. Cover crop — Crop used to cover the soil surface to decrease erosion

T. Soil-improving crop — Crop used to improve or replenish, rather than deplete, soil's organic matter and to improve soil's structure and tilth

U. Soil-conserving crop — Crop used to prevent or retard erosion

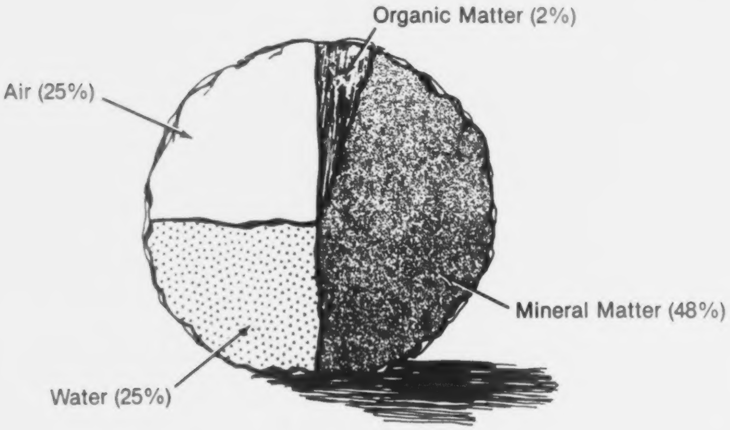
(NOTE: Most cover crops are also soil-conserving crops.)

V. Lime — Calcareous material that neutralizes acidity and supplies calcium to the soil

II. Soil — Outer layer of earth's crust made up of mineral and organic matter capable of supporting plant growth

III. Composition of an average soil (Figure 1)

FIGURE 1



IV. Benefits of organic matter in soil

A. Makes soil porous

INFORMATION SHEET

B. Supplies nutrients to plants

(NOTE: The nutrients in the organic matter become available to plants only after the organic matter has decomposed.)

C. Holds water in soil

D. Furnishes food for soil organisms

E. Stores mineral nutrients

F. Reduces leaching

G. Stabilizes soil structure

V. Reasons soil is important

A. Provides food

B. Provides energy

C. Provides shelter

D. Provides the raw products for clothing

VI. Factors affecting soil formation in a particular location

A. Type of parent material present

EXAMPLE: Sedimentary rock deposited by wind, water, or glaciers

B. Amount of weathering soil is exposed to

(NOTE: There are two kinds of weathering: physical and chemical. *Physical weathering* may be defined as "the mechanical forces caused by temperature changes, such as heating and cooling and freezing and thawing — forces that have soil-abrasive action." *Chemical weathering* may be defined as "the chemical reactions of water, oxygen, and carbon dioxide.")

C. Climate soil is exposed to

EXAMPLES: The temperature extremes and the amount of rainfall at a location

D. Types of plants and animals present

EXAMPLES: Plants present may include lichens, mosses, weeds, grasses, shrubs, or trees; animals present may include bacteria, fungi, birds, or man.

INFORMATION SHEET

E. Amount of slope and drainage at location

EXAMPLES: On sloping hillsides, erosion and leaching are more likely, causing topsoil to be thin and resulting in less available organic matter and less plant growth; on flat lands, erosion and leaching are less likely, causing topsoil to be deeper and resulting in more available organic matter and more plant growth.

VII. Reasons for determining land-capability class

A. Helps you understand the importance of basic soil differences as they affect crop production, erosion, and homesite selection

B. Helps you determine management practices important to proper use of soil and water

C. Develops your understanding of different soil- and water-conservation practices

D. Helps you understand the influence of land features on production and land protection

E. Helps you select a farm for lease or purchase

VIII. Factors that determine the land-capability class

A. Surface texture

B. Depth of soil (horizons)

(NOTE: Horizons are the layers of soil that can be seen in a soil profile. Depth of soil [horizons] refers to the total thickness of the surfaces and subsoil plus any parent material that is favorable for root development.)

C. Slope

D. Erosion

E. Permeability

F. Surface runoff

IX. Physical features of a soil that contribute to its texture

A. Size of soil particles comprising soil

(NOTE: Natural soils are comprised of three types of soil particles of varying sizes: sand, silt, and clay, with sand being the coarsest and clay being the finest.)

INFORMATION SHEET

B. Relative proportion of soil particles in soil

(NOTE: The relative proportion of soil particles [sand, silt, or clay] in a particular soil determine the soil's textural name.)

C. Structure of soil

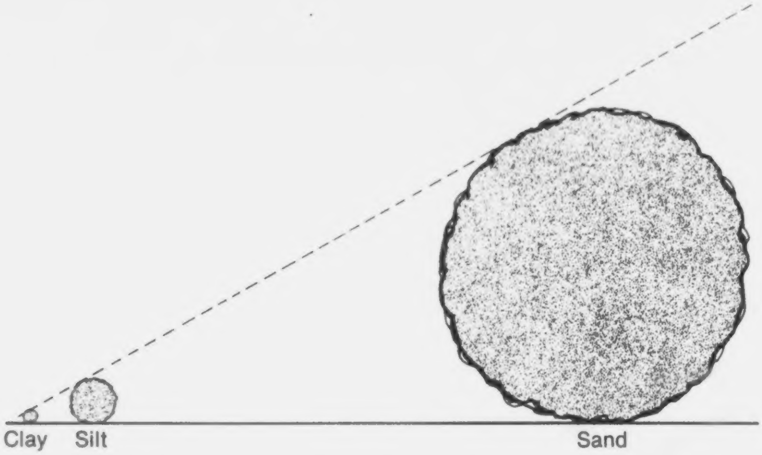
(NOTE: A soil's structure is the shape and arrangement of soil particles into aggregates [clusters of particles].)

D. Color of soil

(NOTE: A soil's color indicates the amount of organic matter and moisture in the soil, which in turn help determine its texture.)

X. Major soil-particle groups classified according to size (Figure 2)

FIGURE 2



INFORMATION SHEET

XI. Major soil-texture classifications and their soil characteristics

(NOTE: Textural names are given to soils based upon the relative proportions of sand, silt, or clay in the soil. Soils that have a high proportion of sand content are given the textural-class name of *sand*; soils that have a high proportion of silt content are given the textural-class name of *silt*; and soils with high proportion of clay content are given the textural-class name of *clay*. You will also hear the term *loam* in reference to soil texture; loam is a soil that contains about 20 percent or less clay and near equal amounts of sand and silt in the remaining 80 percent.)

A. Sand — Soil that when rubbed between the fingers feels rough and gritty

EXAMPLE: Coarse-textured soil

B. Silt — Soil that when rubbed between the fingers feels velvety like wheat flour

EXAMPLES: Moderately coarse-textured soil, medium-textured soil, moderately fine-textured soil

C. Clay — Soil that when rubbed between the fingers feels sticky

EXAMPLE: Fine-textured soil

XII. Subdivisions of the soil-texture classifications and their soil characteristics

A. Coarse-textured soil — Soil that is loose and very friable with individual grains that can be readily seen or felt; when dry, soil squeezed between thumb and forefinger feels very gritty and will fall apart as pressure is released; when moist, soil squeezed between thumb and forefinger forms an unstable mold that crumbles as soil is handled

EXAMPLE: Sand

B. Moderately coarse-textured soil — Soil that is gritty and contains silt and clay and individual grains of sand that can readily be seen and felt; when dry, soil squeezed between thumb and forefinger forms a mold that breaks readily when handled; when wet, soil squeezed between thumb and forefinger forms a mold that can be carefully handled without breaking, and soil may stain fingers slightly

EXAMPLE: Sandy loam

C. Medium-textured soil — Soil that when moist stains fingers, may have a slightly gritty, smooth, or velvety feel, and when squeezed between thumb and forefinger, forms a mold that can be handled freely without breaking, but will not ribbon; when dry, soil squeezed between thumb and forefinger forms a mold that will bear careful handling

EXAMPLE: Loam

INFORMATION SHEET

D. Moderately fine-textured soil — Soil that when dry breaks into clods or lumps; when moist, soil stains fingers, may have a slightly gritty or velvety feel, and will form a short ribbon that will tend to break or bend downward when squeezed between thumb and forefinger

EXAMPLE: Clay-loam

E. Fine-textured soil — Soil that when dry forms very hard lumps or clods; when wet, soil stains fingers, is quite plastic and sticky, may feel slightly gritty or velvety, and will form a long ribbon that will support itself when squeezed between thumb and forefinger

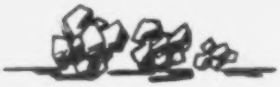
EXAMPLE: Clay

XIII. Kinds of soil structures and their definitions (Figures 3-9)

A. Crumb — Structure in which particles are grouped into very porous, irregularly sized grains

EXAMPLE:

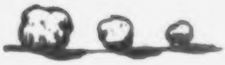
FIGURE 3



B. Granular — Structure in which particles are grouped into spherical aggregates with indistinct sides

EXAMPLE:

FIGURE 4

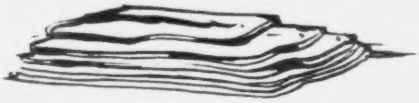


INFORMATION SHEET

C. Platy — Structure in which particles are grouped into flat, tubular aggregates with a thin vertical axis and a long horizontal axis

EXAMPLE:

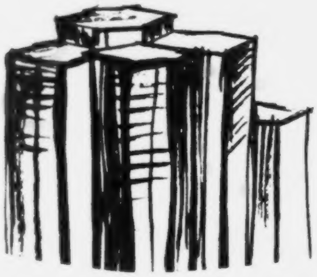
FIGURE 5



D. Prismatic — Structure in which particles are grouped into prismlike aggregates with a vertical axis that is longer than the horizontal axis

EXAMPLE:

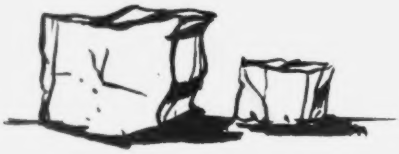
FIGURE 6



E. Blocky — Structure in which particles are grouped into round (subangular) or angular aggregates with equal sides

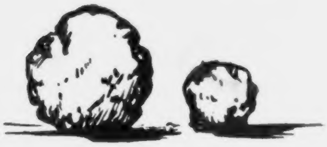
EXAMPLES:

FIGURE 7: Angular blocky structure



INFORMATION SHEET

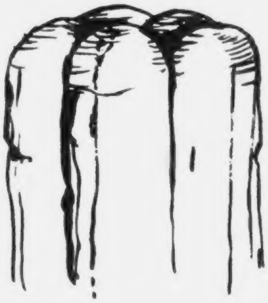
FIGURE 8: Round (subangular) blocky structure



F. Columnar — Structure in which particles are grouped into columnlike aggregates with a vertical axis that is longer than the horizontal axis

EXAMPLE:

FIGURE 9



XIV. Characteristics of soil indicated by soil color

A. Dark brown to black — Usually indicates that soil has a high organic-matter content

(NOTE: Dark brown to black soil is usually regarded as being the most productive soil.)

B. Red or reddish brown — May indicate that soil has a high iron content

(NOTE: Red or reddish brown soil is regarded as being less fertile than black or dark brown soil.)

C. Yellow — Usually indicates that soil drains poorly

(NOTE: Yellow soil is regarded as having low productivity.)

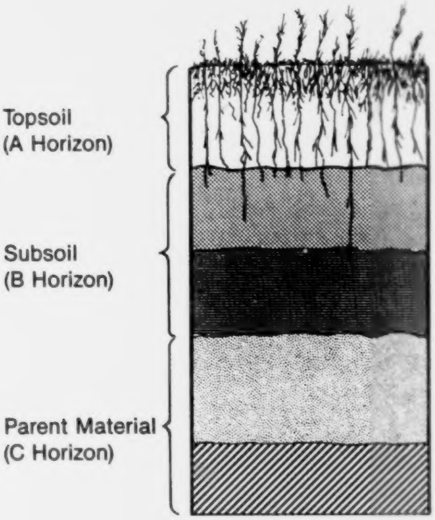
D. Gray — Indicates that soil is low in organic matter, iron, and oxygen

INFORMATION SHEET

XV. Horizons in a soil profile and their definitions (Figure 10)

EXAMPLE:

FIGURE 10



A. Topsoil (A horizon) — Soil layer directly under our feet; zone in which seeds are planted and cultivated

(NOTE: Topsoil is sometimes referred to as *surface soil*.)

B. Subsoil (B horizon) — Soil layer found just below the topsoil; zone that is the storehouse for moisture and minerals

C. Parent material (C horizon) — Soil layer immediately below the subsoil

(NOTE: Parent material is sometimes referred to as the *substratum*.)

XVI. Degrees of soil depth and their definitions

A. Deep — Soil that is more than 40 inches deep

B. Moderately deep — Soil that is 20 to 40 inches deep

C. Shallow — Soil that is 10 to 20 inches deep

D. Very shallow — Soil that is less than 10 inches deep

INFORMATION SHEET

XVII. Degrees of slope and their definitions

(NOTE: Slope is the number of feet of fall [or rise] in each 100 feet.)

A. Nearly level — Slope with less than 1 foot of fall in each 100 feet

B. Gently sloping — Slope with from 1 to 3 feet of fall in each 100 feet

C. Moderatley sloping — Slope with from 3 to 5 feet of fall in each 100 feet

D. Strongly sloping — Slope with from 5 to 8 feet of fall in each 100 feet

E. Steep — Slope with from 8 to 15 feet of fall in each 100 feet

F. Very steep — Slope with more than 15 feet of fall in each 100 feet

XVIII. Types of erosion

A. Wind

B. Water

XIX. Degrees of erosion and their definitions

(NOTE: To help you determine the percentage of erosion that has occurred on a field, review soil survey maps or check near fence rows or wind breaks to find the original topsoil depth.)

A. None to slight — Degree of erosion in which less than 25 percent of the surface soil has been removed, with no gullies, and with a plow layer that exhibits characteristics of the A horizon

B. Moderate — Degree of erosion in which 25 to 75 percent of the surface soil has been removed, with or without gullies, and with a plow layer that consists of a mixture of the surface A horizon and underlying B horizon

C. Severe — Degree of erosion in which 75 percent or more of the surface soil has been removed, with occasional uncrossable gullies more than 100 feet apart and/or severe accumulation by wind, and with a plow layer that exhibits predominantly B-horizon characteristics

(NOTE: An uncrossable gully is one that cannot be crossed or is very difficult to cross with farm equipment.)

D. Very severe — Degree of erosion in which 75 percent or more of the surface soil has been removed, with frequent uncrossable gullies less than 100 feet apart and/or severe accumulation by wind, and with a plow layer that exhibits characteristics similar to severely eroded soil

XX. Categories of water erosion and their definitions

A. Sheet — Fairly uniform layer of soil is removed by rain and surface runoff

B. Rill — Surface-runoff water accumulates into small channels on slopes

C. Gully — Rapidly moving surface-runoff water accumulates into channels, and channels grow wider and deeper

(NOTE: When a rill gets deeper than 1 foot, it is called a *gully*.)

XXI. Management practices that aid in erosion control

A. Providing water-control systems

EXAMPLES: Terracing, diversion ditches, strip-cropping, crop rotation, waterways, contour farming

B. Planting cover crops

C. Controlling gullies

D. Using fertilizer

E. Using land properly

F. Using conservation tillage

XXII. Wind-erosion conservation practices

A. Strip-cropping

B. Preventing burning

C. Preventing overgrazing

D. Conserving moisture

E. Planting emergency cover crops

F. Using emergency tillage operations

G. Stubble mulching

H. Planting shelterbelts

I. Using low-till/no-till residue management

XXIII. Degrees of permeability and their soil characteristics

(NOTE: *Permeability* is the term used to describe the ease in which air and water are able to go down into a soil and return back toward the surface.)

A. Rapid — Soil that has a sandy subsoil

(NOTE: The movement of air and water through the soil is restricted very little in a rapid soil.)

INFORMATION SHEET

B. Moderate — Soil that has a highly granular, clay-loam subsoil

(NOTE: A moderate soil can be either an easily crumbled or pulverized soil or a slightly firm soil with a loamy subsoil that has a blocky, subangular blocky, or prismatic structure.)

C. Slow — Soil that has a crumbly, clayey subsoil

(NOTE: A slow soil has a firm, loamy, or clayey subsoil with a medium blocky, subangular blocky, or prismatic structure, and usually contains more than 35 percent clay.)

D. Very slow — Soil that has a dense, heavy clay or claypan subsoil

(NOTE: A very slow soil has a massive or sharply angular blocky structure, and root growth and movement are generally restricted to the areas between the blocks.)

XXIV. Rates of surface runoff and their definitions

(NOTE: *Surface runoff* is the relative rate water is removed by flow over a soil's surface.)

A. Rapid — Surface water flows away rapidly over fields with a slope of 3 percent or above (except for rapid-permeability soils)

B. Moderate — Surface water flows away at a normal rate over fields with a slope of from 1 to 3 percent (except for rapid-permeability soils)

C. Slow — Surface water flows away slowly

(NOTE: Slow fields include nearly level areas with moderately permeable subsoils or nearly level, slowly permeable sandy soils. On a slow field with clayey soil, surplus water will occasionally be a problem.)

D. Very slow — Surface water flows away very slowly and soil may remain wet for long periods of time

(NOTE: Very slow fields have slopes that range from nearly level to concave with deep sandy soils and rapidly permeable subsoil, or they can be nearly level fields with sandy soils and moderate permeability.)

XXV. Land-capability classes and their definitions

(NOTE: *Land-capability classes* is the United States Department of Agriculture's classification system developed to define the degrees of suitability and limitations for land use that will keep the soil permanently productive. For example, Class I lands are suitable for nearly any use, but the uses for Class VIII lands are so restricted that use is limited to recreation, wildlife, or watershed.)

A. Class I — Land with soils having few limitations that restrict use; overhead water does not change land class; treatment is usually on adjacent soils

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B. Class II — Land with soils having severe limitations that reduce the choice of plants or require moderate conservation practices

C. Class III — Land with soils having severe limitations that reduce the choice of plants, require special conservation practices, or both

D. Class IV — Land with soils having severe limitations that restrict the choice of plants, require very careful management and special conservation, or both

E. Class V — Land with soils having little or no erosion hazards but having other limitations that are impractical to remove and limit use largely to pasture, range, woodland, or wildlife food and cover; hazards include very poor drainage with wet, poorly drained profiles or frequently flooded areas

F. Class VI — Land with soils having severe limitations that make it unsuited for cultivation and restricts use to pasture, range, woodland, or wildlife food and cover

G. Class VII — Land with soils having very severe limitations that make it unsuited for cultivation and restricts use to grazing, woodland, or wildlife

H. Class VIII — Land with soils or land forms having limitations that preclude use to commercial plant production and restrict use to wildlife, recreation, water supply, or scenic purposes

XXVI. Suitable uses for land-capability class(es)

A. Classes I, II, III, and IV — Land suited for cultivation as well as uses such as grazing, forestry, or wildlife food and cover

B. Classes V, VI, and VII — Land not suited for cultivation, but suited for uses such as grazing, forestry, or wildlife food and cover

C. Class VIII — Land not suited for cultivation, grazing, or forestry, but suited for uses such as wildlife, recreation, water supply, or scenic purposes

XXVII. General guidelines for selecting best land-capability class for certain soil factors (Table 1)

(NOTE: Under certain circumstances, a combination of factors may change the best land class shown in the table below.)

TABLE 1: General guidelines for selecting best land-capability class

Land-capability factor	Soil factor	Best land class
Texture	Coarse	III
	Moderately coarse, medium, moderately fine, fine	I

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TABLE 1 (Continued)

Land-capability factor	Soil factor	Best land class
Depth	Deep, moderately deep	I
	Shallow	III
	Very shallow	VII
Permeability	Rapid	III
	Moderate, slow	I
	Very slow	II
Slope	Nearly level (0% to 1%)	I
	Gently sloping (1% to 3%)	II
	Moderately sloping (3% to 5%)	III
	Strongly sloping (5% to 8%)	IV
	Steep (8% to 15%), very steep (15% and over)	VI
Erosion	None to slight	I
	Moderate	II
	Severe, very severe	VI
Surface runoff	Rapid	III
	Moderate, slow	I
	Very slow	II

XXVIII. Types of recommended land treatments applied to land-capability classes

A. Vegetative practices

B. Mechanical treatments

C. Fertilizer applications

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XXIX. Types of vegetative practices and the land-capability class(es) each is applied to (Table 2)

TABLE 2: Types of vegetative practices and the land-capability class(es) each is applied to

Vegetative practice	Land class(es)
Row cropping with soil-conserving crop	
Row cropping with occasional soil-conserving crop	I
Row cropping with frequent soil-conserving crop	II
Row cropping not more than two out of five years	III
Row cropping not more than one out of five years	IV
Returning crop residue to soil	I, II, III, IV
Practicing conservation tillage (NOTE: Practicing conservation tillage provides a protective cover of crop residue used as a mulch on or mixed into the surface soil. At least a 30 percent residue should remain on the soil surface after planting.)	I, II, III, IV
Establishing recommended grass or grasses and legumes (NOTE: This practice is used when permanent vegetation is needed but is not used on land where tree plantings are made.)	V, VI, VII
Practicing proper pasture and range management (NOTE: Properly managing pastures and ranges involves encouraging the growth of desirable grasses and legumes while crowding out weeds and brush and minimizing soil erosion.)	V, VI, VII
Protecting vegetation from burning	V, VI, VII, VIII

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TABLE 2 (Continued)

Vegetative practice	Land class(es)
Practicing control grazing (NOTE: Control grazing is a system of deferred or rotational grazing and proper stocking that will maintain or improve desirable vegetation on pasture or range. The practice is not used where tree plantings are made.)	V, VI, VII
Planting recommended trees (NOTE: Land needing windbreaks is planted in trees, or trees may be used as commercial woodland plantings.)	VIII
Practicing selective harvesting (NOTE: Selective harvesting is a system of cutting in which single trees — usually the largest trees — or small groups of trees are removed and reproduction is secured under the remaining stand.)	VIII
Establishing wildlife or recreation areas (NOTE: Class VIII lands cannot be used for grazing, forestry, cultivation, or urban uses.)	VIII

XXX. Types of mechanical treatments and their correct uses (Table 3)

TABLE 3: Types of mechanical treatments and their correct uses

Mechanical treatment	Use
Controlling brush and trees (NOTE: Controlling brush and trees may be accomplished by spraying them with chemicals and/or using machinery to remove them. The purpose of removing brush and trees is to improve the desired vegetative cover or to make the land suitable for farming. Brush and trees should not be removed by normal farm plowing.)	Used on all land-capability classes except Class VIII

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TABLE 3 (Continued)

Mechanical treatment	Use
Terracing and farming on contour (NOTE: All soils, except coarse-textured, with slopes over 1 percent need terraces.)	Used on land-capability Classes II, III, and IV (depending on soil, slope, cover, erosion, and intensive use)
Maintaining terraces	Used any time terracing and farming on contour are recommended
Constructing diversion terraces (NOTE: An overhead water problem could be created for a field that lies at the bottom of a hill.)	Used whenever field has overhead water problem
Installing drainage system (NOTE: Drainage systems are used to remove excess surface or ground water from land by means of surface or subsurface drains.)	Used where wetness is a factor
Controlling gullies	Used when active gullies are a problem
No treatment needed	Used when brush and trees, erosion, gullies, drainage, or outside water are *not* problems (NOTE: Specifically, no mechanical treatments would be used when brush and trees and outside water are not problems on Class I land, when erosion or drainage are not problems on Class II land, and where gully-erosion control is not recommended on sandy soils.)

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XXXI. Types of fertilizer applications and soil type each is applied to (Table 4)

TABLE 4: Types of fertilizer applications and soil type each is applied to

Type of application	Soil type
Soil amendments (NOTE: Add lime as an amendment when a soil test reveals an acid condition [soil with a pH of less than 6.3]. However, do not add lime to a soil with a pH of 6.3 or above. Soil with a pH above 8.0 is alkaline, which may indicate a salinity, and requires that sulphur or a similar amendment should be applied to reduce the pH to a more favorable level.)	Soil with a pH of less than 6.3 or more than 8.0
Phosphate (P_2O_5)*	Soil with a phosphate level of less than 60 pounds per acre (NOTE: Do not add phosphorus if level is at 60 pounds per acre or more.)
Potassium (K_2O)*	Soil with a potassium level of less than 300 pounds per acre (NOTE: Do not add potassium if level is at 300 pounds per acre or more.)
Nitrogen (N)*	Soil with any deficiency in nitrogen

*A complete fertilizer contains phosphate, potassium, and nitrogen.

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XXXII. Factors that may influence land-capability class and the land treatment applied to each (Table 5)

TABLE 5: Factors influencing land-capability class and the land treatment applied to each

Factor	Land treatment
Wetness (NOTE: Wetness keeps land out of Class I. Moderately wet land is placed in Class II, and wet land is placed in Class V.)	Installing drainage system (NOTE: Only moderately wet land can benefit from this treatment.)
Frequently flooded (NOTE: Frequently flooded land is placed in Class V.)	No mechanical treatment applies
Overhead water (NOTE: Overhead water does not take land out of Class I, but it does require the construction of a diversion terrace.)	Constructing diversion terraces
Needs windbreak	Planting recommended trees; protecting from burning
Desires post lot or wood lot	Planting recommended trees; practicing selective harvesting of trees; protecting from burning
Timber production	Planting recommended trees, practicing selective harvesting of trees; protecting from burning (NOTE: These land treatments are applied *only* if the operator desires to go into timber production in adapted areas.)

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

ASSIGNMENT SHEET #1 — DETERMINE DEGREE OF EROSION

NAME ______________________________ SCORE ______________

Some amount of erosion is inevitable. In fact, an erosion rate is considered acceptable on most cropland, pasture, and forest land if the amount of eroded soil can be replaced yearly through natural soil-formation processes. Erosion becomes a threat to productivity *only* when the annual rate of erosion exceeds the rate at which new soil is formed.

To determine the degree of erosion that has taken place on a piece of land, first check soil survey maps to find the original topsoil depth, then measure the correct topsoil depth, compute the percent of erosion that has taken place, and then match the description of the land and the calculated percentage of erosion to the definition of the degrees of erosion.

In this assignment sheet, you will practice determining the degree of erosion that has taken place on four fields. Study the definitions of the degrees of erosion in Section XIX of the information sheet; read each of the case studies below; calculate the percent of erosion that has taken place on each field, showing your work in the space provided; and then write an "X" in the blank beside the answer that indicates the correct degree of erosion for that field.

Case Study #1

Field #1 has a plow layer that exhibits characteristics of the A horizon, no uncrossable gullies, and the current topsoil depth measures at 10 inches. Records indicate that the original topsoil depth was 12 inches. What is the percent of erosion that has taken place, and which of the following is the correct degree of erosion in this field?

Percent of erosion = ______________________________

Degree of erosion =

_____a. None to slight

_____b. Moderate

_____c. Severe

_____d. Very severe

ASSIGNMENT SHEET #1

Case Study #2

In Field #2 there is one uncrossable gully, a plow layer that exhibits predominately B-horizon characteristics, and a topsoil depth that measures at 3 inches. Records indicate that the original topsoil depth was 14 inches. What is the percent of erosion that has taken place, and which of the following is the correct degree of erosion in this field?

Percent of erosion = ______________________________

Degree of erosion =

______a. None to slight
______b. Moderate
______c. Severe
______d. Very severe

Case Study #3

Field #3 has a sandy topsoil, very slow permeability, a plow layer that consists of a mixture of A horizon and B horizon, a topsoil depth that measures at 5 inches, and no uncrossable gullies. Records indicate that the original topsoil depth was 15 inches. What is the percent of erosion that has taken place, and which of the following is the correct degree of erosion in this field?

Percent of erosion = ______________________________

Degree of erosion =

______a. None to slight
______b. Moderate
______c. Severe
______d. Very severe

ASSIGNMENT SHEET #1

Case Study #4

Field #4 has been used as a recreational area for dune buggies. The plow layer exhibits predominately B-horizon characteristics and the sandy topsoil has been measured at a depth of 2 inches. There are several very severe blowouts in the field and several sand dunes have been created by the wind. Records indicate that the original topsoil depth was 10 inches. What is the percent of erosion that has taken place, and which of the following is the correct degree of erosion in this field?

Percent of erosion = ______________________________

Degree of erosion =

_____a. None to slight

_____b. Moderate

_____c. Severe

_____d. Very severe

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

ASSIGNMENT SHEET #2 — COMPLETE A SOIL-CLASSIFICATION WORKSHEET

NAME ________________________________ SCORE ____________

In the past, people have used vague terms to classify land. Some people classified land according to its use by calling it "good pasture land" or "good cotton land," while others classified land on the basis of its selling price. They described good land as land selling for $500 per acre or $1000 per acre. In an effort to standardize land classifications, the Soil Conservation Service of the USDA established eight land-capability classes that define the degrees of suitability and limitations for land use that will keep soil permanently productive. Also, soil-classification worksheets have been developed to help you in determining the correct land-capability class and use for a particular piece of land. This assignment sheet is designed to give you practice in using a soil-classification worksheet to classify land.

Review the sections of the information sheet dealing with the soil texture, depth of soil, slope, erosion, permeability, surface runoff, land-capability classes, and best use for land, and then read the case studies below. After careful review of the information presented, fill out a soil-classification worksheet (found at the end of this assignment sheet) for each of the five case studies presented. Write an "X" in the blank before each correct answer for each category shown on the worksheet.

Case Study #1

In Field #1, the soil forms very hard lumps or clods when dry and is very sticky when wet. The subsoil appears to be firm clay-loam with medium-blocky, subangular-blocky, and prismatic structures. When squeezed between the fingers, the wet subsoil forms a short ribbon that tends to break or bend downward. The topsoil is 6 inches deep and the subsoil is 28 inches deep. The original topsoil was 10 inches deep. There is a 4-foot slope and no uncrossable gullies.

Case Study #2

In Field #2, the topsoil appears to be a mixture of sand, silt, and clay that feels slightly gritty to the touch and, when moistened and squeezed between the fingers, forms a mold that can be handled freely without breaking but will not ribbon. The subsoil is a slightly firm loam that, when squeezed between the fingers, forms a short ribbon. The topsoil depth is 10 inches, the subsoil depth is 24 inches, and the original topsoil was 12 inches deep. There is a 6-inch slope and no uncrossable gullies.

Case Study #3

The topsoil in Field #3 feels gritty when rubbed between the fingers. The subsoil is a slightly firm, sandy loam that when moistened forms a mold that can be carefully handled without breaking. The topsoil is 4 inches deep, the subsoil is 30 inches deep, and the original topsoil was 18 inches deep. There is a 2-foot slope and no uncrossable gullies.

ASSIGNMENT SHEET #2

Case Study #4

Field #4 appears to be excellent bottomland, but it does lay along a creek and is subject to frequent flooding. The topsoil is a mixture of sand, silt, and clay. When the topsoil is moistened and squeezed through the fingers, it will not ribbon but will hold a mold that can be handled freely. The subsoil appears to be a firm clay-loam that, when moistened and squeezed between the fingers, forms a short ribbon. The topsoil is 10 inches deep, the subsoil is 24 inches deep, and the original topsoil was 12 inches deep. There is a 2-foot slope and no uncrossable gullies.

Case Study #5

In Field #5, the topsoil is sticky and forms very hard lumps or clods when dry. The subsoil appears to be very firm, dense, and clayey with massive or sharply angular-blocky structures. Root growth and movement are generally restricted to the areas between the blocks. The topsoil is 6 inches deep, the subsoil is 12 inches deep, and the original topsoil was 10 inches deep. There is a 6-foot slope and no uncrossable gullies.

(NOTE: On loamy and clayey soils of shallow depth, any slope over 3 percent will be checked as a major factor and will lower the land-capability class by one class.)

ASSIGNMENT SHEET #2

Soil-Classification Worksheet

Field # _____

Texture

Topsoil		Subsoil
_____	Coarse	_____
_____	Moderately coarse	_____
_____	Medium	_____
_____	Moderately fine	_____
_____	Fine	_____

Depth of soil

_____ Deep
_____ Moderately deep
_____ Shallow
_____ Very shallow

Slope

_____ Nearly level
_____ Gently sloping
_____ Moderately sloping
_____ Strongly sloping
_____ Steep
_____ Very steep

Erosion

_____ None to slight
_____ Moderate
_____ Severe
_____ Very severe

Permeability

_____ Rapid
_____ Moderate
_____ Slow
_____ Very slow

Surface runoff

_____ Rapid
_____ Moderate
_____ Slow
_____ Very slow

Major factors that keep land area out of Class I

_____ Texture
_____ Depth
_____ Slope
_____ Erosion
_____ Permeability
_____ Runoff
_____ Wetness
_____ Flooding
_____ None

Land-capability class

_____ Class I
_____ Class II
_____ Class III
_____ Class IV
_____ Class V
_____ Class VI
_____ Class VII
_____ Class VIII

Highest safe use for land

_____ Cropland
_____ Pasture
_____ Wildlife and recreation

ASSIGNMENT SHEET #2

Soil-Classification Worksheet Field # ______

Texture

Topsoil		Subsoil
______	Coarse	______
______	Moderately coarse	______
______	Medium	______
______	Moderately fine	______
______	Fine	______

Depth of soil

______ Deep
______ Moderately deep
______ Shallow
______ Very shallow

Slope

______ Nearly level
______ Gently sloping
______ Moderately sloping
______ Strongly sloping
______ Steep
______ Very steep

Erosion

______ None to slight
______ Moderate
______ Severe
______ Very severe

Permeability

______ Rapid
______ Moderate
______ Slow
______ Very slow

Surface runoff

______ Rapid
______ Moderate
______ Slow
______ Very slow

Major factors that keep land area out of Class I

______ Texture
______ Depth
______ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class II
______ Class III
______ Class IV
______ Class V
______ Class VI
______ Class VII
______ Class VIII

Highest safe use for land

______ Cropland
______ Pasture
______ Wildlife and recreation

ASSIGNMENT SHEET #2

Soil-Classification Worksheet Field # ______

Texture

Topsoil	Subsoil
______ Coarse	______
______ Moderately coarse	______
______ Medium	______
______ Moderately fine	______
______ Fine	______

Depth of soil

______ Deep
______ Moderately deep
______ Shallow
______ Very shallow

Slope

______ Nearly level
______ Gently sloping
______ Moderately sloping
______ Strongly sloping
______ Steep
______ Very steep

Erosion

______ None to slight
______ Moderate
______ Severe
______ Very severe

Permeability

______ Rapid
______ Moderate
______ Slow
______ Very slow

Surface runoff

______ Rapid
______ Moderate
______ Slow
______ Very slow

Major factors that keep land area out of Class I

______ Texture
______ Depth
______ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class II
______ Class III
______ Class IV
______ Class V
______ Class VI
______ Class VII
______ Class VIII

Highest safe use for land

______ Cropland
______ Pasture
______ Wildlife and recreation

ASSIGNMENT SHEET #2

Soil-Classification Worksheet

Field # ______

Texture

Topsoil		Subsoil
______	Coarse	______
______	Moderately coarse	______
______	Medium	______
______	Moderately fine	______
______	Fine	______

Depth of soil

______ Deep
______ Moderately deep
______ Shallow
______ Very shallow

Slope

______ Nearly level
______ Gently sloping
______ Moderately sloping
______ Strongly sloping
______ Steep
______ Very steep

Erosion

______ None to slight
______ Moderate
______ Severe
______ Very severe

Permeability

______ Rapid
______ Moderate
______ Slow
______ Very slow

Surface runoff

______ Rapid
______ Moderate
______ Slow
______ Very slow

Major factors that keep land area out of Class I

______ Texture
______ Depth
______ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class II
______ Class III
______ Class IV
______ Class V
______ Class VI
______ Class VII
______ Class VIII

Highest safe use for land

______ Cropland
______ Pasture
______ Wildlife and recreation

ASSIGNMENT SHEET #2

Soil-Classification Worksheet   Field # ______

Texture

Topsoil		Subsoil
______	Coarse	______
______	Moderately coarse	______
______	Medium	______
______	Moderately fine	______
______	Fine	______

Depth of soil

______ Deep
______ Moderately deep
______ Shallow
______ Very shallow

Slope

______ Nearly level
______ Gently sloping
______ Moderately sloping
______ Strongly sloping
______ Steep
______ Very steep

Erosion

______ None to slight
______ Moderate
______ Severe
______ Very severe

Permeability

______ Rapid
______ Moderate
______ Slow
______ Very slow

Surface runoff

______ Rapid
______ Moderate
______ Slow
______ Very slow

Major factors that keep land area out of Class I

______ Texture
______ Depth
______ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class II
______ Class III
______ Class IV
______ Class V
______ Class VI
______ Class VII
______ Class VIII

Highest safe use for land

______ Cropland
______ Pasture
______ Wildlife and recreation

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

ASSIGNMENT SHEET #3 — COMPLETE A RECOMMENDED-LAND-TREATMENT WORKSHEET

NAME ______________________________ SCORE ______________

Some American land can be safely cultivated; however, most lands should not be used for growing row crops. Some lands slope too much and if they were cultivated for row crops the topsoil would wash downhill at unacceptable rates. Some lands have high water tables or flood occasionally and are too wet to be cultivated. Some lands are too shallow to permit proper root development. And other lands are too stony or too dry. By working with the USDA's land-capability classes, you can determine the best uses for your land and the best land treatments that can be applied to keep the land from eroding or to retain its productivity.

This assignment sheet is designed to give you practice in selecting the land treatments that should be applied to certain land-capability classes. Study Sections XXIX, XXX, and XXXI of the information sheet, and read the case studies below, in which you will be given the land-capability class and other major factors describing five fields. After careful review of the information presented, fill out a recommended-land-treatment worksheet (located at the end of this assignment sheet) for each case study. Write an "X" in the blank before each correct answer for each category shown on the worksheet.

Case Study #1

The land-capability class for Field #1 is Class III. The major factors keeping the field out of Class I are a moderately sloping slope, moderate erosion, and rapid runoff. There are no terraces in the field site. Soil tests indicate a pH of 6.0, a phosphate level of 65 pounds per acre, a potassium level of 150 pounds per acre, and a nitrogen deficiency.

Case Study #2

Field #2 has no major factors that keep it out of Class I. Soil tests indicate a pH of 7.0, a phosphate level of 50 pounds per acre, a potassium level of 250 pounds per acre, and a deficiency in nitrogen.

Case Study #3

Field #3 has been classified at Class VI. The major factors that keep the field out of Class I are a sandy texture, gently sloping slope, and severe erosion. There are no uncrossable gullies, and the land has been used as native grass pasture for the last few years. There is occasional brush on the field site. Soil tests indicate a pH of 7.5, a phosphate level of 70 pounds per acre, a potassium level of 350 pounds per acre, and a nitrogen level sufficient to maintain pastureland.

ASSIGNMENT SHEET #3

Case Study #4

Field #4 is excellent bottomland, but it is classified at Class V because of its gently sloping slope and frequent flooding. The field lays along a creek, but there is no problem with brush or trees. Soil tests indicate a pH of 6.8, a phosphate level of 62 pounds per acre, a potassium level of 125 pounds per acre, and sufficient nitrogen levels.

Case Study #5

Field #5 has been classified as Class VI land. The major factors keeping the land out of Class I were very slow permeability, shallow depth, a strongly sloping slope, moderate erosion, and rapid runoff. There are considerable brush and trees on the field site. Soil tests indicate a pH of 6.0, a phosphate level of 60 pounds per acre, a potassium level of 300 pounds per acre, and a sufficient level of nitrogen.

ASSIGNMENT SHEET #3

Recommended-Land-Treatment Worksheet

Field # ______

Major factors keeping land out of Class I

______ Texture
______ Depth
______ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class V
______ Class II
______ Class VI
______ Class III
______ Class VII
______ Class IV
______ Class VIII

Vegetative land treatments

______ Row crop with occasional soil-conserving crop
______ Row crop with frequent soil-conserving crop
______ Row crop not more than two out of four years
______ Row crop not more than one out of five years
______ Return crop residue to the soil
______ Practice conservation tillage
______ Establish recommended grass or grasses and legumes
______ Practice proper pasture and range management
______ Protect from burning
______ Control grazing
______ Plant recommended trees
______ Harvest trees selectively
______ Use only for wildlife or recreation area

Mechanical land treatments

______ Control brush or trees
______ Terrace and farm on contour
______ Maintain terraces
______ Construct diversion terraces
______ Install drainage system
______ Control gullies
______ No mechanical treatment needed

Fertilizer and soil amendments

______ Soil amendments
______ Phosphorus (P_2O_5)
______ Potassium (K_2O)
______ Nitrogen (N)
______ Fertilizer or soil amendments not needed

ASSIGNMENT SHEET #3

Recommended-Land-Treatment Worksheet

Field # ______

Major factors keeping land out of Class I

______ Texture
______ Depth
______ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class II
______ Class III
______ Class IV
______ Class V
______ Class VI
______ Class VII
______ Class VIII

Vegetative land treatments

______ Row crop with occasional soil-conserving crop
______ Row crop with frequent soil-conserving crop
______ Row crop not more than two out of four years
______ Row crop not more than one out of five years
______ Return crop residue to the soil
______ Practice conservation tillage
______ Establish recommended grass or grasses and legumes
______ Practice proper pasture and range management
______ Protect from burning
______ Control grazing
______ Plant recommended trees
______ Harvest trees selectively
______ Use only for wildlife or recreation area

Mechanical land treatments

______ Control brush or trees
______ Terrace and farm on contour
______ Maintain terraces
______ Construct diversion terraces
______ Install drainage system
______ Control gullies
______ No mechanical treatment needed

Fertilizer and soil amendments

______ Soil amendments
______ Phosphorus (P_2O_5)
______ Potassium (K_2O)
______ Nitrogen (N)
______ Fertilizer or soil amendments not needed

ASSIGNMENT SHEET #3

Recommended-Land-Treatment Worksheet

Field # ______

Major factors keeping land out of Class I

______ Texture
______ Depth
______ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class V
______ Class II
______ Class VI
______ Class III
______ Class VII
______ Class IV
______ Class VIII

Vegetative land treatments

______ Row crop with occasional soil-conserving crop
______ Row crop with frequent soil-conserving crop
______ Row crop not more than two out of four years
______ Row crop not more than one out of five years
______ Return crop residue to the soil
______ Practice conservation tillage
______ Establish recommended grass or grasses and legumes
______ Practice proper pasture and range management
______ Protect from burning
______ Control grazing
______ Plant recommended trees
______ Harvest trees selectively
______ Use only for wildlife or recreation area

Mechanical land treatments

______ Control brush or trees
______ Terrace and farm on contour
______ Maintain terraces
______ Construct diversion terraces
______ Install drainage system
______ Control gullies
______ No mechanical treatment needed

Fertilizer and soil amendments

______ Soil amendments
______ Phosphorus (P_2O_5)
______ Potassium (K_2O)
______ Nitrogen (N)
______ Fertilizer or soil amendments not needed

ASSIGNMENT SHEET #3

Recommended-Land-Treatment Worksheet

Field # ______

Major factors keeping land out of Class I

______ Texture
______ Depth
______ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class V
______ Class II
______ Class VI
______ Class III
______ Class VII
______ Class IV
______ Class VIII

Vegetative land treatments

______ Row crop with occasional soil-conserving crop
______ Row crop with frequent soil-conserving crop
______ Row crop not more than two out of four years
______ Row crop not more than one out of five years
______ Return crop residue to the soil
______ Practice conservation tillage
______ Establish recommended grass or grasses and legumes
______ Practice proper pasture and range management
______ Protect from burning
______ Control grazing
______ Plant recommended trees
______ Harvest trees selectively
______ Use only for wildlife or recreation area

Mechanical land treatments

______ Control brush or trees
______ Terrace and farm on contour
______ Maintain terraces
______ Construct diversion terraces
______ Install drainage system
______ Control gullies
______ No mechanical treatment needed

Fertilizer and soil amendments

______ Soil amendments
______ Phosphorus (P_2O_5)
______ Potassium (K_2O)
______ Nitrogen (N)
______ Fertilizer or soil amendments not needed

ASSIGNMENT SHEET #3

Recommended-Land-Treatment Worksheet

Field # ______

Major factors keeping land out of Class I

______ Texture
______ Depth
______ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class II
______ Class III
______ Class IV
______ Class V
______ Class VI
______ Class VII
______ Class VIII

Vegetative land treatments

______ Row crop with occasional soil-conserving crop
______ Row crop with frequent soil-conserving crop
______ Row crop not more than two out of four years
______ Row crop not more than one out of five years
______ Return crop residue to the soil
______ Practice conservation tillage
______ Establish recommended grass or grasses and legumes
______ Practice proper pasture and range management
______ Protect from burning
______ Control grazing
______ Plant recommended trees
______ Harvest trees selectively
______ Use only for wildlife or recreation area

Mechanical land treatments

______ Control brush or trees
______ Terrace and farm on contour
______ Maintain terraces
______ Construct diversion terraces
______ Install drainage system
______ Control gullies
______ No mechanical treatment needed

Fertilizer and soil amendments

______ Soil amendments
______ Phosphorus (P_2O_5)
______ Potassium (K_2O)
______ Nitrogen (N)
______ Fertilizer or soil amendments not needed

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

ASSIGNMENT SHEET #4 — DETERMINE LAND-CAPABILITY CLASSES AND SELECT LAND TREATMENTS

NAME ______________________________ SCORE ____________

Land judging allows you to put to use all the facts you have learned about soil classification and serves as a tool to help you better understand

- The basic differences in soils and how these differences affect crop production and erosion.
- The different practices used to manage soil and water effectively.
- The effect of land factors on land use and management.
- The effect of soil- and water-conservation practices.

The purpose of Part I of this assignment sheet is to make you more familiar with filling out a land-judging score card, while Part II guides you through the procedures followed at land-judging events.

PART I

Read the case study below and study the score card on the following page. Then determine the land-capability class of the land site described and select land treatments that would be appropriate to the site. Write an "X" in the square before each correct answer for each category shown on the score card.

Case Study

The surface texture of the soil on this site forms very hard clods when dry but is sticky when wet. The subsoil is a firm clay-loam that when moistened forms a short ribbon as it is squeezed between the fingers. The topsoil is 12 inches deep, the subsoil is 30 inches deep, and the original topsoil depth was 15 inches. There is a 4-foot slope, and the land is terraced and is being farmed on the contour. There are no uncrossable gullies, but there is a hill above the site that creates an overhead water problem. Soil tests indicate a pH of 7.0, a phosphate level of 57 pounds per acre, a potassium level of 200 pounds per acre, and a nitrogen deficiency.

ASSIGNMENT SHEET #4

	SOIL FACTORS - PART I (Put an "X" in appropriate square.)
SCORE	
	A. **Texture** Sur Sub ☐ ☐ 1. Coarse ☐ ☐ 2. Moderately coarse ☐ ☐ 3. Medium ☐ ☐ 4. Moderately fine ☐ ☐ 5. Fine
	B. **Depth of soil** ☐ 1. Deep ☐ 2. Moderately deep ☐ 3. Shallow ☐ 4. Very shallow
	C. **Slope** ☐ 1. Nearly level ☐ 2. Gently sloping ☐ 3. Moderately sloping ☐ 4. Strongly sloping ☐ 5. Steep ☐ 6. Very steep
	D. **Erosion — wind & water** ☐ 1. None to slight ☐ 2. Moderate ☐ 3. Severe ☐ 4. Very severe
	Interpretations of soil factors
	E. **Permeability** ☐ 1. Rapid ☐ 2. Moderate ☐ 3. Slow ☐ 4. Very slow
	F. **Surface runoff** ☐ 1. Rapid ☐ 2. Moderate ☐ 3. Slow ☐ 4. Very slow
	G. **Major factors that keep area out of Class I** ☐ 1. Texture ☐ 6. Runoff ☐ 2. Depth ☐ 7. Wetness ☐ 3. Slope ☐ 8. Flooding ☐ 4. Erosion ☐ 9. None ☐ 5. Permeability
	H. **Land-capability class** ☐ 1. Class I ☐ 5. Class V ☐ 2. Class II ☐ 6. Class VI ☐ 3. Class III ☐ 7. Class VII ☐ 4. Class IV ☐ 8. Class VIII

	RECOMMENDED LAND TREATMENTS PART 2
SCORE	
	A. **Vegetative** ☐ 1. Row crop/occasional soil-conserving crop ☐ 2. Row crop/frequent soil-conserving crop ☐ 3. Row crops not more than 2 out of 4 years ☐ 4. Row crops not more than 1 out of 5 years ☐ 5. Return crop residue to the soil ☐ 6. Practice conservation tillage ☐ 7. Establish recommended grass or grasses and legumes ☐ 8. Proper pasture and range management ☐ 9. Protect from burning ☐ 10. Control grazing ☐ 11. Plant recommended trees ☐ 12. Harvest trees selectively ☐ 13. Use only for a wildlife or recreation area
	B. **Mechanical** ☐ 14. Control brush or trees ☐ 15. Terrace and farm on contour ☐ 16. Maintain terraces ☐ 17. Construct diversion terraces ☐ 18. Install drainage system ☐ 19. Control gullies ☐ 20. No mechanical treatment needed
	C. **Fertilizer & soil amendments** ☐ 21. Soil amendments ☐ 22. Phosphorus (P_2O_5) ☐ 23. Potassium (K_2O) ☐ 24. Nitrogen (N) ☐ 25. Fertilizer or soil amendments not needed

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ASSIGNMENT SHEET #4

PART II

Study the following procedures for selecing a field for judging, and then prepare four sites as directed, determine the land-capability class, select land treatments for each site, and then fill out a score card for each site. Score cards are found at the end of this assignment sheet. Write an "X" in the square before each correct answer for each category shown on the score card.

Procedure for selecting field for judging

A. Select field

B. Select representative site within field; site must be at least 100 feet wide and 100 feet long, but does not have to be square

C. Dig a hole to expose the soil profile; hole should be deep enough to show topsoil, subsoil, and soil depth

D. Put samples of topsoil and subsoil near hole

E. Set flags or stakes to indicate boundary of area to be considered

F. Set flags or stakes to indicate a 100-foot distance for estimating slope

G. Provide the following information about the field's condition

CONDITION OF FIELD

FIELD NO.______

1. Soil tests show:
   a. pH
   b. Phosphorus ______ lb/acre P_2O_5
   c. Potassium ______ lb/acre K_2O
   d. Nitrogen ______ lb/acre N
   e. Other:
2. Pay no attention to present mechanical practices.
3. Thickness of original topsoil was ______ inches.
4. Size of field is ______ acres.
5. Treat for most intensive use.
6. Other factors:

ASSIGNMENT SHEET #4

LAND-JUDGING SCORE CARD

Oklahoma Vocational Agriculture

SOIL FACTORS - PART I
(Put an "X" in appropriate square.)

SCORE

A. Texture
Sur Sub
☐ ☐ 1. Coarse
☐ ☐ 2. Moderately coarse
☐ ☐ 3. Medium
☐ ☐ 4. Moderately fine
☐ ☐ 5. Fine

B. Depth of soil
☐ 1. Deep
☐ 2. Moderately deep
☐ 3. Shallow
☐ 4. Very shallow

C. Slope
☐ 1. Nearly level
☐ 2. Gently sloping
☐ 3. Moderately sloping
☐ 4. Strongly sloping
☐ 5. Steep
☐ 6. Very steep

D. Erosion — wind & water
☐ 1. None to slight
☐ 2. Moderate
☐ 3. Severe
☐ 4. Very severe

Interpretations of soil factors

E. Permeability
☐ 1. Rapid
☐ 2. Moderate
☐ 3. Slow
☐ 4. Very slow

F. Surface runoff
☐ 1. Rapid
☐ 2. Moderate
☐ 3. Slow
☐ 4. Very slow

G. Major factors that keep area out of Class I
☐ 1. Texture
☐ 2. Depth
☐ 3. Slope
☐ 4. Erosion
☐ 5. Permeability
☐ 6. Runoff
☐ 7. Wetness
☐ 8. Flooding
☐ 9. None

H. Land-capability class
☐ 1. Class I
☐ 2. Class II
☐ 3. Class III
☐ 4. Class IV
☐ 5. Class V
☐ 6. Class VI
☐ 7. Class VII
☐ 8. Class VIII

RECOMMENDED LAND TREATMENTS
PART 2

SCORE

A. Vegetative
☐ 1. Row crop/occasional soil-conserving crop
☐ 2. Row crop/frequent soil-conserving crop
☐ 3. Row crops not more than 2 out of 4 years
☐ 4. Row crops not more than 1 out of 5 years
☐ 5. Return crop residue to the soil
☐ 6. Practice conservation
☐ 7. Establish recommended grass or grasses and legumes
☐ 8. Proper pasture and range management
☐ 9. Protect from burning
☐ 10. Control grazing
☐ 11. Plant recommended trees
☐ 12. Harvest trees selectively
☐ 13. Use only for a wildlife or recreation area

B. Mechanical
☐ 14. Control brush or trees
☐ 15. Terrace and farm on contour
☐ 16. Maintain terraces
☐ 17. Construct diversion terraces
☐ 18. Install drainage system
☐ 19. Control gullies
☐ 20. No mechanical treatment needed

C. Fertilizier & soil amendments
☐ 21. Soil amendments
☐ 22. Phosphorus (P_2O_5)
☐ 23. Potassium (K_2O)
☐ 24. Nitrogen (N)
☐ 25. Fertilizier or soil amendments not needed

Student ____________________ **Field No.** ________

Score Part I (Possible 45) ____________
Score Part II (Possible 30) ____________
Total Score (Possible 75) ____________

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ASSIGNMENT SHEET #4

LAND-JUDGING SCORE CARD

Oklahoma Vocational Agriculture

SCORE	SOIL FACTORS - PART I (Put an "X" in appropriate square.)	SCORE	RECOMMENDED LAND TREATMENTS PART 2
	A. Texture Sur Sub ☐ ☐ 1. Coarse ☐ ☐ 2. Moderately coarse ☐ ☐ 3. Medium ☐ ☐ 4. Moderately fine ☐ ☐ 5. Fine **B. Depth of soil** ☐ 1. Deep ☐ 2. Moderately deep ☐ 3. Shallow ☐ 4. Very shallow		**A. Vegetative** ☐ 1. Row crop/occasional soil-conserving crop ☐ 2. Row crop/frequent soil-conserving crop ☐ 3. Row crops not more than 2 out of 4 years ☐ 4. Row crops not more than 1 out of 5 years ☐ 5. Return crop residue to the soil ☐ 6. Practice conservation ☐ 7. Establish recommended grass or grasses and legumes ☐ 8. Proper pasture and range management ☐ 9. Protect from burning ☐ 10. Control grazing ☐ 11. Plant recommended trees ☐ 12. Harvest trees selectively ☐ 13. Use only for a wildlife or recreation area
	C. Slope ☐ 1. Nearly level ☐ 2. Gently sloping ☐ 3. Moderately sloping ☐ 4. Strongly sloping ☐ 5. Steep ☐ 6. Very steep **D. Erosion — wind & water** ☐ 1. None to slight ☐ 2. Moderate ☐ 3. Severe ☐ 4. Very severe		**B. Mechanical** ☐ 14. Control brush or trees ☐ 15. Terrace and farm on contour ☐ 16. Maintain terraces ☐ 17. Construct diversion terraces ☐ 18. Install drainage system ☐ 19. Control gullies ☐ 20. No mechanical treatment needed
	Interpretations of soil factors **E. Permeability** ☐ 1. Rapid ☐ 2. Moderate ☐ 3. Slow ☐ 4. Very slow		**C. Fertilizier & soil amendments** ☐ 21. Soil amendments ☐ 22. Phosphorus (P_2O_5) ☐ 23. Potassium (K_2O) ☐ 24. Nitrogen (N) ☐ 25. Fertilizier or soil amendments not needed
	F. Surface runoff ☐ 1. Rapid ☐ 2. Moderate ☐ 3. Slow ☐ 4. Very slow		
	G. Major factors that keep area out of Class I ☐ 1. Texture ☐ 2. Depth ☐ 3. Slope ☐ 4. Erosion ☐ 5. Permeability ☐ 6. Runoff ☐ 7. Wetness ☐ 8. Flooding ☐ 9. None		**Student** ____________________ **Field No.** ________
	H. Land-capability class ☐ 1. Class I ☐ 2. Class II ☐ 3. Class III ☐ 4. Class IV ☐ 5. Class V ☐ 6. Class VI ☐ 7. Class VII ☐ 8. Class VIII		

Score Part I (Possible 45) ____________________ Score Part II (Possible 30) ____________________ Total Score (Possible 75) ____________________

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ASSIGNMENT SHEET #4

LAND-JUDGING SCORE CARD

Oklahoma Vocational Agriculture

SOIL FACTORS - PART I
(Put an "X" in appropriate square.)

SCORE

A. Texture
Sur Sub
☐ ☐ 1. Coarse
☐ ☐ 2. Moderately coarse
☐ ☐ 3. Medium
☐ ☐ 4. Moderately fine
☐ ☐ 5. Fine

B. Depth of soil
☐ 1. Deep
☐ 2. Moderately deep
☐ 3. Shallow
☐ 4. Very shallow

C. Slope
☐ 1. Nearly level
☐ 2. Gently sloping
☐ 3. Moderately sloping
☐ 4. Strongly sloping
☐ 5. Steep
☐ 6. Very steep

D. Erosion — wind & water
☐ 1. None to slight
☐ 2. Moderate
☐ 3. Severe
☐ 4. Very severe

Interpretations of soil factors

E. Permeability
☐ 1. Rapid
☐ 2. Moderate
☐ 3. Slow
☐ 4. Very slow

F. Surface runoff
☐ 1. Rapid
☐ 2. Moderate
☐ 3. Slow
☐ 4. Very slow

G. Major factors that keep area out of Class I
☐ 1. Texture
☐ 2. Depth
☐ 3. Slope
☐ 4. Erosion
☐ 5. Permeability
☐ 6. Runoff
☐ 7. Wetness
☐ 8. Flooding
☐ 9. None

H. Land-capability class
☐ 1. Class I
☐ 2. Class II
☐ 3. Class III
☐ 4. Class IV
☐ 5. Class V
☐ 6. Class VI
☐ 7. Class VII
☐ 8. Class VIII

RECOMMENDED LAND TREATMENTS PART 2

SCORE

A. Vegetative
☐ 1. Row crop/occasional soil-conserving crop
☐ 2. Row crop/frequent soil-conserving crop
☐ 3. Row crops not more than 2 out of 4 years
☐ 4. Row crops not more than 1 out of 5 years
☐ 5. Return crop residue to the soil
☐ 6. Practice conservation
☐ 7. Establish recommended grass or grasses and legumes
☐ 8. Proper pasture and range management
☐ 9. Protect from burning
☐ 10. Control grazing
☐ 11. Plant recommended trees
☐ 12. Harvest trees selectively
☐ 13. Use only for a wildlife or recreation area

B. Mechanical
☐ 14. Control brush or trees
☐ 15. Terrace and farm on contour
☐ 16. Maintain terraces
☐ 17. Construct diversion terraces
☐ 18. Install drainage system
☐ 19. Control gullies
☐ 20. No mechanical treatment needed

C. Fertilizier & soil amendments
☐ 21. Soil amendments
☐ 22. Phosphorus (P_2O_5)
☐ 23. Potassium (K_2O)
☐ 24. Nitrogen (N)
☐ 25. Fertilizier or soil amendments not needed

Student ____________________ **Field No.** ________

Score Part I (Possible 45) ______________
Score Part II (Possible 30) ______________
Total Score (Possible 75) ______________

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ASSIGNMENT SHEET #4

LAND-JUDGING SCORE CARD

Oklahoma Vocational Agriculture

SOIL FACTORS - PART I
(Put an "X" in appropriate square.)

SCORE

A. Texture
Sur Sub
☐ ☐ 1. Coarse
☐ ☐ 2. Moderately coarse
☐ ☐ 3. Medium
☐ ☐ 4. Moderately fine
☐ ☐ 5. Fine

B. Depth of soil
☐ 1. Deep
☐ 2. Moderately deep
☐ 3. Shallow
☐ 4. Very shallow

C. Slope
☐ 1. Nearly level
☐ 2. Gently sloping
☐ 3. Moderately sloping
☐ 4. Strongly sloping
☐ 5. Steep
☐ 6. Very steep

D. Erosion — wind & water
☐ 1. None to slight
☐ 2. Moderate
☐ 3. Severe
☐ 4. Very severe

Interpretations of soil factors

E. Permeability
☐ 1. Rapid
☐ 2. Moderate
☐ 3. Slow
☐ 4. Very slow

F. Surface runoff
☐ 1. Rapid
☐ 2. Moderate
☐ 3. Slow
☐ 4. Very slow

G. Major factors that keep area out of Class I
☐ 1. Texture
☐ 2. Depth
☐ 3. Slope
☐ 4. Erosion
☐ 5. Permeability
☐ 6. Runoff
☐ 7. Wetness
☐ 8. Flooding
☐ 9. None

H. Land-capability class
☐ 1. Class I
☐ 2. Class II
☐ 3. Class III
☐ 4. Class IV
☐ 5. Class V
☐ 6. Class VI
☐ 7. Class VII
☐ 8. Class VIII

RECOMMENDED LAND TREATMENTS PART 2

SCORE

A. Vegetative
☐ 1. Row crop/occasional soil-conserving crop
☐ 2. Row crop/frequent soil-conserving crop
☐ 3. Row crops not more than 2 out of 4 years
☐ 4. Row crops not more than 1 out of 5 years
☐ 5. Return crop residue to the soil
☐ 6. Practice conservation
☐ 7. Establish recommended grass or grasses and legumes
☐ 8. Proper pasture and range management
☐ 9. Protect from burning
☐ 10. Control grazing
☐ 11. Plant recommended trees
☐ 12. Harvest trees selectively
☐ 13. Use only for a wildlife or recreation area

B. Mechanical
☐ 14. Control brush or trees
☐ 15. Terrace and farm on contour
☐ 16. Maintain terraces
☐ 17. Construct diversion terraces
☐ 18. Install drainage system
☐ 19. Control gullies
☐ 20. No mechanical treatment needed

C. Fertilizier & soil amendments
☐ 21. Soil amendments
☐ 22. Phosphorus (P_2O_5)
☐ 23. Potassium (K_2O)
☐ 24. Nitrogen (N)
☐ 25. Fertilizier or soil amendments not needed

Student ____________________ **Field No.** ________

Score Part I (Possible 45) ____________
Score Part II (Possible 30) ____________
Total Score (Possible 75) ____________

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SELECT SOIL-CONSERVATION PRACTICES
UNIT II

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

Case Study #1
Percent of erosion = 17%
Degree of erosion = None to slight

Case Study #2
Percent of erosion = 79%
Degree of erosion = Severe

Case Study #3
Percent of erosion = 67%
Degree of erosion = Moderate

Case Study #4
Percent of erosion = 80%
Degree of erosion = Very severe

Assignment Sheet #2 — See following pages

Assignment Sheet #3 — See following pages

Assignment Sheet #4 — See following pages

ANSWERS TO ASSIGNMENT SHEET #2

Soil-Classification Worksheet

Field # 1

Texture

Topsoil		Subsoil
_____	Coarse	_____
_____	Moderately coarse	_____
_____	Medium	_____
_____	Moderately fine	X
X	Fine	_____

Depth of soil

_____ Deep
X Moderately deep
_____ Shallow
_____ Very shallow

Slope

_____ Nearly level
_____ Gently sloping
X Moderately sloping
_____ Strongly sloping
_____ Steep
_____ Very steep

Erosion

_____ None to slight
X Moderate
_____ Severe
_____ Very severe

Permeability

_____ Rapid
_____ Moderate
X Slow
_____ Very slow

Surface runoff

X Rapid
_____ Moderate
_____ Slow
_____ Very slow

Major factors that keep land area out of Class I

_____ Texture
_____ Depth
X Slope
X Erosion
_____ Permeability
X Runoff
_____ Wetness
_____ Flooding
_____ None

Land-capability class

_____ Class I
_____ Class II
X Class III
_____ Class IV
_____ Class V
_____ Class VI
_____ Class VII
_____ Class VIII

Highest safe use for land

X Cropland
_____ Pasture
_____ Wildlife and recreation

ANSWERS TO ASSIGNMENT SHEET #2

Soil-Classification Worksheet

Field # 2

Texture

Topsoil		Subsoil
	Coarse	
	Moderately coarse	
X	Medium	
	Moderately fine	X
	Fine	

Depth of soil

- Deep
- X Moderately deep
- Shallow
- Very shallow

Slope

- X Nearly level
- Gently sloping
- Moderately sloping
- Strongly sloping
- Steep
- Very steep

Erosion

- X None to slight
- Moderate
- Severe
- Very severe

Permeability

- Rapid
- X Moderate
- Slow
- Very slow

Surface runoff

- Rapid
- Moderate
- X Slow
- Very slow

Major factors that keep land area out of Class I

- Texture
- Depth
- Slope
- Erosion
- Permeability
- Runoff
- Wetness
- Flooding
- X None

Land-capability class

- X Class I
- Class II
- Class III
- Class IV
- Class V
- Class VI
- Class VII
- Class VIII

Highest safe use for land

- X Cropland
- Pasture
- Wildlife and recreation

ANSWERS TO ASSIGNMENT SHEET #2

Soil-Classification Worksheet Field # 3

Texture

	Topsoil	Subsoil
Coarse	✓	
Moderately coarse		✓
Medium		
Moderately fine		
Fine		

Depth of soil

Deep
[✓ Moderately deep]
Shallow
Very shallow

Slope

Nearly level
[✓ Gently sloping]
Moderately sloping
Strongly sloping
Steep
Very steep

Erosion

None to slight
Moderate
[✓ Severe]
Very severe

Permeability

Rapid
[✓ Moderate]
Slow
Very slow

Surface runoff

Rapid
[✓ Moderate]
Slow
Very slow

Major factors that keep land area out of Class I

[✓ Texture]
Depth
[✓ Slope]
[✓ Erosion]
Permeability
Runoff
Wetness
Flooding
None

Land-capability class

Class I
Class II
Class III
Class IV
Class V
[✓ Class VI]
Class VII
Class VIII

Highest safe use for land

Cropland
[✓ Pasture]
Wildlife and recreation

ANSWERS TO ASSIGNMENT SHEET #2

Soil-Classification Worksheet

Field # __4__

Texture

Topsoil		Subsoil
______	Coarse	______
______	Moderately coarse	______
__X__	Medium	______
______	Moderately fine	__X__
______	Fine	______

Depth of soil

______ Deep
__X__ Moderately deep
______ Shallow
______ Very shallow

Slope

______ Nearly level
__X__ Gently sloping
______ Moderately sloping
______ Strongly sloping
______ Steep
______ Very steep

Erosion

__X__ None to slight
______ Moderate
______ Severe
______ Very severe

Permeability

______ Rapid
______ Moderate
__X__ Slow
______ Very slow

Surface runoff

______ Rapid
__X__ Moderate
______ Slow
______ Very slow

Major factors that keep land area out of Class I

______ Texture
______ Depth
__X__ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
__X__ Flooding
______ None

Land-capability class

______ Class I
______ Class II
______ Class III
______ Class IV
__X__ Class V
______ Class VI
______ Class VII
______ Class VIII

Highest safe use for land

______ Cropland
__X__ Pasture
______ Wildlife and recreation

ANSWERS TO ASSIGNMENT SHEET #2

Soil-Classification Worksheet

Field # 5

Texture

Topsoil		Subsoil
______	Coarse	______
______	Moderately coarse	______
______	Medium	______
______	Moderately fine	______
__X__	Fine	__X__

Depth of soil

______ Deep
______ Moderately deep
__X__ Shallow
______ Very shallow

Slope

______ Nearly level
______ Gently sloping
______ Moderately sloping
__X__ Strongly sloping
______ Steep
______ Very steep

Erosion

______ None to slight
__X__ Moderate
______ Severe
______ Very severe

Permeability

______ Rapid
______ Moderate
______ Slow
__X__ Very slow

Surface runoff

__X__ Rapid
______ Moderate
______ Slow
______ Very slow

Major factors that keep land area out of Class I

______ Texture
__X__ Depth
__X__ Slope
__X__ Erosion
__X__ Permeability
__X__ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class II
______ Class III
______ Class IV
______ Class V
__X__ Class VI
______ Class VII
______ Class VIII

Highest safe use for land

______ Cropland
__X__ Pasture
______ Wildlife and recreation

ANSWERS TO ASSIGNMENT SHEET #3

Recommended-Land-Treatment Worksheet

Field # ___1___

Major factors keeping land out of Class I

______ Texture
______ Depth
___X___ Slope
___X___ Erosion
______ Permeability
___X___ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class V
______ Class II
______ Class VI
___X___ Class III
______ Class VII
______ Class IV
______ Class VIII

Vegetative land treatments

______ Row crop with occasional soil-conserving crop
______ Row crop with frequent soil-conserving crop
___X___ Row crop not more than two out of four years
______ Row crop not more than one out of five years
___X___ Return crop residue to the soil
___X___ Practice conservation tillage
______ Establish recommended grass or grasses and legumes
______ Practice proper pasture and range management
______ Protect from burning
______ Control grazing
______ Plant recommended trees
______ Harvest trees selectively
______ Use only for wildlife or recreation area

Mechanical land treatments

______ Control brush or trees
___X___ Terrace and farm on contour
___X___ Maintain terraces
______ Construct diversion terraces
______ Install drainage system
______ Control gullies
______ No mechanical treatment needed

Fertilizer and soil amendments

___X___ Soil amendments
______ Phosphorus (P_2O_5)
___X___ Potassium (K_2O)
___X___ Nitrogen (N)
______ Fertilizer or soil amendments not needed

ANSWERS TO ASSIGNMENT SHEET #3

Recommended-Land-Treatment Worksheet

Field # __2__

Major factors keeping land out of Class I

______ Texture
______ Depth
______ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
______ Flooding
___X___ None

Land-capability class

___X___ Class I
______ Class II
______ Class III
______ Class IV
______ Class V
______ Class VI
______ Class VII
______ Class VIII

Vegetative land treatments

___X___ Row crop with occasional soil-conserving crop
______ Row crop with frequent soil-conserving crop
______ Row crop not more than two out of four years
______ Row crop not more than one out of five years
___X___ Return crop residue to the soil
___X___ Practice conservation tillage
______ Establish recommended grass or grasses and legumes
______ Practice proper pasture and range management
______ Protect from burning
______ Control grazing
______ Plant recommended trees
______ Harvest trees selectively
______ Use only for wildlife or recreation area

Mechanical land treatments

______ Control brush or trees
______ Terrace and farm on contour
______ Maintain terraces
______ Construct diversion terraces
______ Install drainage system
______ Control gullies
___X___ No mechanical treatment needed

Fertilizer and soil amendments

______ Soil amendments
___X___ Phosphorus (P_2O_5)
___X___ Potassium (K_2O)
___X___ Nitrogen (N)
______ Fertilizer or soil amendments not needed

ANSWERS TO ASSIGNMENT SHEET #3

Recommended-Land-Treatment Worksheet

Field # 3

Major factors keeping land out of Class I

- [✓ Texture]
- Depth
- [✓ Slope]
- [✓ Erosion]
- Permeability
- Runoff
- Wetness
- Flooding
- None

Land-capability class

- Class I
- Class V
- Class II
- [✓ Class VI]
- Class III
- Class VII
- Class IV
- Class VIII

Vegetative land treatments

- Row crop with occasional soil-conserving crop
- Row crop with frequent soil-conserving crop
- Row crop not more than two out of four years
- Row crop not more than one out of five years
- Return crop residue to the soil
- Practice conservation tillage
- [✓ Establish recommended grass or grasses and legumes]
- [✓ Practice proper pasture and range management]
- [✓ Protect from burning]
- [✓ Control grazing]
- Plant recommended trees
- Harvest trees selectively
- Use only for wildlife or recreation area

Mechanical land treatments

- [✓ Control brush or trees]
- Terrace and farm on contour
- Maintain terraces
- Construct diversion terraces
- Install drainage system
- Control gullies
- No mechanical treatment needed

Fertilizer and soil amendments

- Soil amendments
- Phosphorus (P_2O_5)
- Potassium (K_2O)
- Nitrogen (N)
- [✓ Fertilizer or soil amendments not needed]

ANSWERS TO ASSIGNMENT SHEET #3

Recommended-Land-Treatment Worksheet

Field # __4__

Major factors keeping land out of Class I

______ Texture
______ Depth
___X___ Slope
______ Erosion
______ Permeability
______ Runoff
______ Wetness
___X___ Flooding
______ None

Land-capability class

______ Class I
___X___ Class V
______ Class II
______ Class VI
______ Class III
______ Class VII
______ Class IV
______ Class VIII

Vegetative land treatments

______ Row crop with occasional soil-conserving crop
______ Row crop with frequent soil-conserving crop
______ Row crop not more than two out of four years
______ Row crop not more than one out of five years
______ Return crop residue to the soil
______ Practice conservation tillage
___X___ Establish recommended grass or grasses and legumes
___X___ Practice proper pasture and range management
___X___ Protect from burning
___X___ Control grazing
______ Plant recommended trees
______ Harvest trees selectively
______ Use only for wildlife or recreation area

Mechanical land treatments

______ Control brush or trees
______ Terrace and farm on contour
______ Maintain terraces
______ Construct diversion terraces
______ Install drainage system
______ Control gullies
___X___ No mechanical treatment needed

Fertilizer and soil amendments

______ Soil amendments
______ Phosphorus (P_2O_5)
___X___ Potassium (K_2O)
______ Nitrogen (N)
______ Fertilizer or soil amendments not needed

ANSWERS TO ASSIGNMENT SHEET #3

Recommended-Land-Treatment Worksheet

Field # 5

Major factors keeping land out of Class I

______ Texture
___X___ Depth
___X___ Slope
___X___ Erosion
___X___ Permeability
___X___ Runoff
______ Wetness
______ Flooding
______ None

Land-capability class

______ Class I
______ Class V
______ Class II
___X___ Class VI
______ Class III
______ Class VII
______ Class IV
______ Class VIII

Vegetative land treatments

______ Row crop with occasional soil-conserving crop
______ Row crop with frequent soil-conserving crop
______ Row crop not more than two out of four years
______ Row crop not more than one out of five years
______ Return crop residue to the soil
______ Practice conservation tillage
___X___ Establish recommended grass or grasses and legumes
___X___ Practice proper pasture and range management
___X___ Protect from burning
___X___ Control grazing
______ Plant recommended trees
______ Harvest trees selectively
______ Use only for wildlife or recreation area

Mechanical land treatments

___X___ Control brush or trees
______ Terrace and farm on contour
______ Maintain terraces
______ Construct diversion terraces
______ Install drainage system
______ Control gullies
______ No mechanical treatment needed

Fertilizer and soil amendments

___X___ Soil amendments
______ Phosphorus (P_2O_5)
______ Potassium (K_2O)
______ Nitrogen (N)
______ Fertilizer or soil amendments not needed

ANSWERS TO ASSIGNMENT SHEET #4

PART I

	SOIL FACTORS - PART I **(Put an "X" in appropriate square.)**
SCORE	
	A. Texture Sur Sub ☐ ☐ 1. Coarse ☐ ☐ 2. Moderately coarse ☐ ☐ 3. Medium ☐ ☒ 4. Moderately fine ☒ ☐ 5. Fine
	B. Depth of soil ☒ 1. Deep ☐ 2. Moderately deep ☐ 3. Shallow ☐ 4. Very shallow
	C. Slope ☐ 1. Nearly level ☐ 2. Gently sloping ☒ 3. Moderately sloping ☐ 4. Strongly sloping ☐ 5. Steep ☐ 6. Very steep
	D. Erosion — wind & water ☒ 1. None to slight ☐ 2. Moderate ☐ 3. Severe ☐ 4. Very severe
	Interpretations of soil factors
	E. Permeability ☐ 1. Rapid ☐ 2. Moderate ☒ 3. Slow ☐ 4. Very slow
	F. Surface runoff ☒ 1. Rapid ☐ 2. Moderate ☐ 3. Slow ☐ 4. Very slow
	G. Major factors that keep area out of Class I ☐ 1. Texture ☐ 2. Depth ☒ 3. Slope ☐ 4. Erosion ☐ 5. Permeability ☒ 6. Runoff ☐ 7. Wetness ☐ 8. Flooding ☐ 9. None
	H. Land-capability class ☐ 1. Class I ☐ 2. Class II ☒ 3. Class III ☐ 4. Class IV ☐ 5. Class V ☐ 6. Class VI ☐ 7. Class VII ☐ 8. Class VIII

	RECOMMENDED LAND TREATMENTS **PART 2**
SCORE	
	A. Vegetative ☐ 1. Row crop/occasional soil-conserving crop ☐ 2. Row crop/frequent soil-conserving crop ☒ 3. Row crops not more than 2 out of 4 years ☐ 4. Row crops not more than 1 out of 5 years ☒ 5. Return crop residue to the soil ☒ 6. Practice conservation tillage ☐ 7. Establish recommended grass or grasses and legumes ☐ 8. Proper pasture and range management ☐ 9. Protect from burning ☐ 10. Control grazing ☐ 11. Plant recommended trees ☐ 12. Harvest trees selectively ☐ 13. Use only for a wildlife or recreation area
	B. Mechanical ☐ 14. Control brush or trees ☒ 15. Terrace and farm on contour ☒ 16. Maintain terraces ☒ 17. Construct diversion terraces ☐ 18. Install drainage system ☐ 19. Control gullies ☐ 20. No mechanical treatment needed
	C. Fertilizier & soil amendments ☐ 21. Soil amendments ☒ 22. Phosphorus (P_2O_5) ☒ 23. Potassium (K_2O) ☒ 24. Nitrogen (N) ☐ 25. Fertilizier or soil amendments not needed

PART II — Evaluated to the satisfaction of the instructor

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

JOB SHEET #1 — DETERMINE SOIL TEXTURE BY FEEL

I. Materials and equipment

  A. 6 samples of soils that have various textures (provided by instructor or student)

  B. Several containers of water

  C. Towels to wipe hands on

  D. Soil-texture-characteristics chart (See Table 6 on the following page)

  E. Soil-texture worksheet (See last page of this job sheet)

  F. Pen or pencil

II. Procedure

(NOTE: Soil samples should be tested one at a time. First, test a sample when it is dry, and then test the sample when it is wet.)

  A. Number the soil samples from one to six

  B. Using dry hands, feel the texture of dry Soil Sample #1

    1. Note the presence or absence of hard lumps or clods

    2. Note the overall feel of the soil

    EXAMPLES: Gritty, floury, smooth

  C. Refer to Table 6, Soil-Texture Characteristics, and determine soil's characteristics when dry

  D. Record characteristics of dry soil on soil-texture worksheet

  E. Apply a small amount of water to soil sample, and squeeze soil between thumb and forefinger to form a mold

  (NOTE: Apply only enough water to make the soil moist; the soil should not be dripping with water.)

    1. Note whether or not the mold stains your fingers

    2. Note whether or not the mold holds together under pressure

    3. Note whether or not soil can be worked into a ribbon

JOB SHEET #1

F. Refer to Table 6, Soil-Texture Characteristics, and determine soil's characteristics when wet

G. Record characteristics of wet soil sample on soil-texture worksheet

H. Determine texture of soil sample, and record texture on soil-texture worksheet

I. Repeat steps A through H for the remaining soil samples

J. Turn worksheet in to your instructor for evaluation

K. Clean up work area and store equipment and materials properly

TABLE 6: Soil-texture characteristics

Texture	Characteristics	
	Dry	Wet
Coarse	Looks loose and single-grained; feels gritty; when squeezed between thumb and forefinger, falls apart as pressure is released	When squeezed between thumb and forefinger, forms unstable, crumbly mold
Moderately coarse	Feels gritty; contains grains of sand that can be seen and felt; when squeezed between thumb and forefinger, forms a mold that breaks readily when handled	When squeezed between thumb and forefinger, forms a mold that can be carefully handled without breaking; stains fingers slightly
Medium	When squeezed between thumb and forefinger, forms a mold that can be carefully handled	May feel slightly gritty, smooth, or velvety; when squeezed between thumb and forefinger, forms a firm mold that can be handled freely; will not ribbon; stains fingers
Moderately fine	Breaks into clods or lumps that are difficult to break	Feels slightly gritty or velvety; when squeezed between thumb and forefinger, forms a short ribbon that tends to break or bend downward; stains fingers
Fine	Forms very hard lumps or clods that are very difficult to break	Feels slightly gritty or velvety; is quite plastic and usually sticky; when squeezed between thumb and forefinger, forms a long ribbon that will support itself; stains fingers

JOB SHEET #1

Soil-Texture Worksheet

Sample number	Characteristics		Texture
	Dry	Wet	
1			
2			
3			
4			
5			
6			

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

JOB SHEET #2 — USE A SLOPE FINDER TO DETERMINE SLOPE

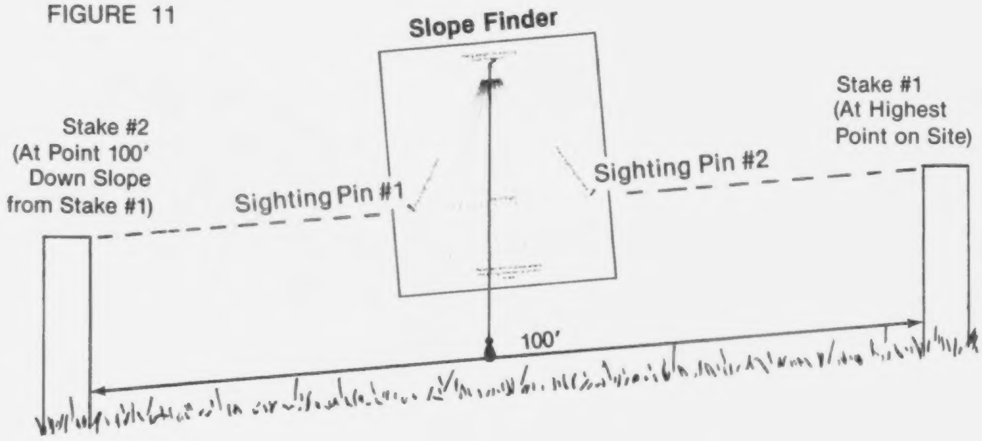
I. Equipment and materials

- A. 2 wooden stakes at least 4 feet long
- B. Hammer or mallet
- C. Slope finder
- D. Paper and pencil

II. Procedure

- A. Locate stakes on site
    1. Locate highest point on site, and drive Stake #1 six inches into ground at this point (See Figure 11)
    2. Pace off approximately 100 feet directly down slope from Stake #1, and drive Stake #2 six inches into ground at this point (See Figure 11)
- B. Use slope finder to determine percent of slope
    1. Standing with slope finder's Sighting Pin #1 over top of Stake #2 and holding slope finder with both hands, bring line marked "Line of Sight" to your eye level (See Figure 11)
    2. Sighting along line-of-sight, align Sighting Pin #2 with top of Stake #1 (Figure 11)

FIGURE 11


Slope Finder
Stake #2 (At Point 100' Down Slope from Stake #1)
Sighting Pin #1
Sighting Pin #2
Stake #1 (At Highest Point on Site)
100'

Adapted from *Lesson Plans for Teaching Basic Vocational Agriculture*, "Section III, Introduction to Soil Management," as compiled by James S. McCully, Jr., from *Experiments in Soil Science*, by Logan S. Carter, California Vocational Educational Productions. Used with permission of the Research and Curriculum Unit for Vocational-Technical Education, Mississippi State University, Jackson, Mississippi.

JOB SHEET #2

3. Allow string and weight on slope finder to come to rest
4. Holding string in place, read the percent of slope where string intersects scale
5. Record percent of slope

C. Use Table 7 to interpret degree of slope from percent of slope

TABLE 7

Percent of slope	Degree of slope
0% to 1%	Nearly level (less than 1 foot of fall in each 100 feet)
1% to 3%	Gently sloping (1 to 3 feet of fall in each 100 feet)
3% to 5%	Moderately sloping (3 to 5 feet of fall in each 100 feet)
5% to 8%	Strongly sloping (5 to 8 feet of fall in each 100 feet)
8% to 15%	Steep (8 to 15 feet of fall in each 100 feet)
Over 15%	Very steep (more than 15 feet of fall in each 100 feet)

D. Record degree of slope

E. Turn in paper to be evaluated by instructor

F. Clean up work area and store equipment and materials properly

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

TEST

NAME ______________________________ SCORE ______________

1. Match to their correct definitions terms associated with selecting soil-conservation practices. Write the correct numbers in the blanks. Terms and definitions continue on the next page.

______a. Embankment or ridge of earth constructed on the contour of a slope to control runoff and minimize erosion

______b. Removal of soil by wind and/or water

______c. General term for decomposing plant and animal material in or on soil

______d. Crop used to improve or replenish, rather than deplete, soil's organic matter and to improve soil's structure and tilth

______e. Single mass or cluster of soil particles

______f. Side view or cross section of soil that allows all soil horizons to be examined

______g. Hue indicating the amount of organic matter, moisture, and texture of a soil

______h. Practice of growing different crops on a field chiefly to preserve the productive power of the soil

______i. Proportion of sand, silt, and clay particles in a soil mass

______j. Unconsolidated mass of rock material from which the soil profile develops

______k. Shape and arrangement of soil particles into aggregates

______l. Practice of growing separate crops in alternate strips running perpendicular to the slope of the land or to the direction of prevailing winds for the purpose of reducing erosion

______m. Crop used to prevent or retard erosion

______n. Development of soil from parent material

1. Strip-cropping
2. Organic matter
3. Soil formation
4. Parent material
5. Soil profile
6. Soil texture
7. Soil-improving crop
8. Soil structure
9. Aggregate
10. Soil color
11. Erosion
12. Soil-conserving crop
13. Terrace
14. Crop rotation

TEST

______o. General term for inorganic elements in soil

______p. Calcareous material that neutralizes acidity and supplies calcium to the soil

______q. Easily crumbled, pulverized, or reduced to powder

______r. Broad, grassy channel that carries water slowly and safely off a field

______s. Channel with a supporting ridge on the lower side; usually constructed to handle a large flow of water and to divert water around a field

______t. Crop used to cover the soil surface to decrease erosion

______u. Process of removing nutrients from soil by the downward movement of water

______v. More or less consolidated mass composed of two or more minerals

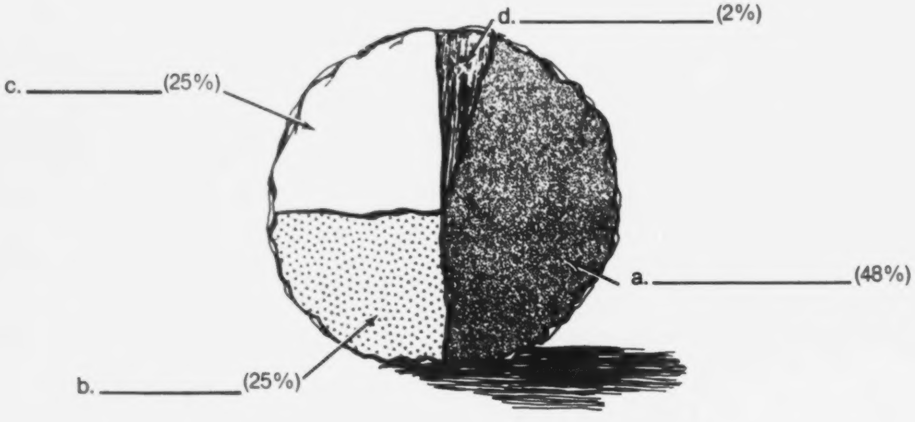
15. Leaching
16. Cover crop
17. Diversion terrace
18. Waterway
19. Rock
20. Friable
21. Mineral
22. Lime

2. Define soil.

____

____

3. Label the following illustration to show the composition of an average soil.



TEST

4. State four benefits of organic matter in soil.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

5. Select from the following list reasons soil is important. Write an "X" in the blank before each correct answer.

_____a. Holds the earth together

_____b. Provides food

_____c. Provides energy

_____d. Provides a base on which to build houses

_____e. Provides shelter

_____f. Provides the raw products for clothing

6. Name four factors affecting soil formation in a particular location.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

7. State four reasons for determining land-capability class.

a. ______________________________

____

b. ______________________________

____

c. ______________________________

____

d. ______________________________

____

TEST

8. List four factors that determine land-capability class.

   a. ____________________

   b. ____________________

   c. ____________________

   d. ____________________

9. List physical features of a soil that contribute to its texture.

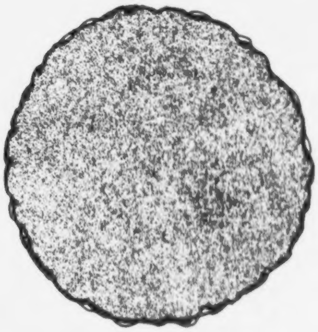
   a. ____________________

   b. ____________________

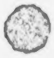
   c. ____________________

   d. ____________________

10. Classify major soil-particle groups according to size. Write the correct names in the blanks beide the illustrations below.



a. ____________________



b. ____________________

c. ____________________

TEST

11. Match major soil-texture classifications to their correct soil characteristics. Write the correct numbers in the blanks.

_____a. Soil that when rubbed between the fingers feels sticky

_____b. Soil that when rubbed between the fingers feels velvety like wheat flour

_____c. Soil that when rubbed between the fingers feels rough and gritty

1. Sand
2. Silt
3. Clay

12. Match subdivisions of the soil-texture classifications to their correct soil characteristics. Write the correct numbers in the blanks.

_____a. Soil that is loose and very friable with individual grains that can be readily seen or felt; when dry, soil squeezed between thumb and forefinger feels very gritty and will fall apart as pressure is released; when moist, soil squeezed between thumb and forefinger forms an unstable mold that crumbles as soil is handled

_____b. Soil that when dry breaks into clods or lumps; when moist, soil stains fingers, may have a slighty gritty or velvety feel, and will form a short ribbon that will tend to break or bend downward when squeezed between thumb and forefinger

_____c. Soil that when moist stains fingers, may have a slightly gritty, smooth, or velvety feel, and when squeezed between thumb and forefinger, forms a mold that can be handled freely without breaking, but will not ribbon; when dry, soil squeezed between thumb and forefinger forms a mold that will bear careful handling

_____d. Soil that when dry forms very hard lumps or clods; when wet, soil stains fingers, is quite plastic and sticky, may feel slightly gritty or velvety, and will form a long ribbon that will support itself when squeezed between thumb and forefinger

_____e. Soil that is gritty and contains silt and clay and individual grains of sand that can readily be seen and felt; when dry, soil squeezed between thumb and forefinger forms a mold that breaks readily when handled; when wet, soil squeezed between thumb and forefinger forms a mold that can be carefully handled without breaking, and soil may stain fingers slightly

1. Coarse-textured soil
2. Moderately coarse-textured soil
3. Medium-textured soil
4. Moderately fine-textured soil
5. Fine-textured soil

TEST

13. Match kinds of soil structures to their correct definitions. Write the correct numbers in the blanks.

______a. Structure in which particles are grouped into prismlike aggregates with a vertical axis that is longer than the horizontal axis

______b. Structure in which particles are grouped into spherical aggregates with indistinct sides

______c. Structure in which particles are grouped into columnlike aggregates with a vertical axis that is longer than the horizontal axis

______d. Structure in which particles are grouped into very porous, irregularly sized grains

______e. Structure in which particles are grouped into flat, tubular aggregates with a thin vertical axis and a long horizontal axis

______f. Structure in which particles are grouped into round (subangular) or angular aggregates with equal sides

1. Crumb
2. Granular
3. Platy
4. Prismatic
5. Blocky
6. Columnar

14. Match soil colors to the correct soil characteristics indicated by color. Write the correct numbers in the blanks.

______a. Usually indicates that soil has a high organic-matter content

______b. Usually indicates that soil drains poorly

______c. May indicate that soil has a high iron content

______d. Indicates that soil is low in organic matter, iron, and oxygen

1. Dark brown to black
2. Red or reddish brown
3. Yellow
4. Gray

15. Match the horizons in a soil profile to their correct definitions. Write the correct numbers in the blanks.

______a. Soil layer found just below the topsoil; zone that is the storehouse for moisture and minerals

______b. Soil layer immediately below the subsoil

______c. Soil layer directly under our feet; zone in which seeds are planted and cultivated

1. Topsoil (A horizon)
2. Subsoil (B horizon)
3. Parent material (C horizon)

TEST

16. Match degrees of soil depth to their correct definitions. Write the correct numbers in the blanks.

_____a. Soil that is 20 to 40 inches deep
_____b. Soil that is more than 40 inches deep
_____c. Soil that is less than 10 inches deep
_____d. Soil that is 10 to 20 inches deep

1. Deep
2. Moderately deep
3. Shallow
4. Very shallow

17. Match degrees of slope to their correct definitions. Write the correct numbers in the blanks.

_____a. Slope with less than 1 foot of fall in each 100 feet
_____b. Slope with from 5 to 8 feet of fall in each 100 feet
_____c. Slope with more than 15 feet of fall in each 100 feet
_____d. Slope with from 8 to 15 feet of fall in each 100 feet
_____e. Slope with from 3 to 5 feet of fall in each 100 feet
_____f. Slope with from 1 to 3 feet of fall in each 100 feet

1. Nearly level
2. Gently sloping
3. Moderately sloping
4. Strongly sloping
5. Steep
6. Very steep

18. List types of erosion.

a. ______________________________

b. ______________________________

19. Match degrees of erosion to their correct definitions. Write the correct numbers in the blanks.

_____a. Degree of erosion in which 75 percent or more of the surface soil has been removed, with occasional uncrossable gullies more than 100 feet apart and/or severe accumulation by wind, and with a plow layer that exhibits predominately B-horizon characteristics

_____b. Degree of erosion in which less than 25 percent of the surface soil has been removed, with no gullies, and with a plow layer that exhibits characteristics of the A horizon

_____c. Degree of erosion in which 75 percent or more of the surface soil has been removed, with frequent uncrossable gullies less than 100 feet apart and/or severe accumulation by wind, and with a plow layer that exhibits characteristics similar to severely eroded soil

_____d. Degree of erosion in which 25 to 75 percent of the surface soil has been removed, with or without gullies, and with a plow layer that consists of a mixture of the surface A horizon and underlying B horizon

1. None to slight
2. Moderate
3. Severe
4. Very severe

TEST

20. Match categories of water erosion to their correct definitions. Write the correct numbers in the blanks.

______a. Surface-runoff water accumulates into small channels on slopes

______b. Rapidly moving surface-runoff water accumulates into channels, and channels grow wider and deeper

______c. Fairly uniform layer of soil is removed by rain and surface runoff

1. Sheet
2. Rill
3. Gully

21. List three management practices that aid in erosion control.

a. ______________________________

b. ______________________________

c. ______________________________

22. Select from the following list wind-erosion conservation practices. Write an "X" in the blank before each correct answer.

______a. Strip-cropping

______b. Planting row crops

______c. Preventing burning

______d. Plowing with mold-board plow

______e. Conserving moisture

______f. Preventing overgrazing

______g. Removing all shelterbelts

______h. Using emergency tillage operations

______i. Planting emergency cover crops

______j. Stubble mulching

______k. Burning crop residue

______l. Planting shelterbelts

______m. Using low-till/no-till residue management

23. Match degrees of permeability to their correct soil characteristics. Write the correct numbers in the blanks.

______a. Soil that has a highly granular, clay-loam subsoil

______b. Soil that has a dense, heavy clay or claypan subsoil

______c. Soil that has a sandy subsoil

______d. Soil that has a crumbly, clayey subsoil

1. Rapid
2. Moderate
3. Slow
4. Very slow

TEST

24. Match rates of surface runoff to their correct definitions. Write the correct numbers in the blanks.

_____a. Surface water flows away slowly

_____b. Surface water flows away very slowly and soil may remain wet for long periods of time

_____c. Surface water flows away rapidly over fields with a slope of 3 percent or above (except for rapid-permeability soils)

_____d. Surface water flows away at a normal rate over fields with a slope of from 1 to 3 percent (except for rapid-permeability soils)

1. Rapid
2. Moderate
3. Slow
4. Very slow

25. Match land-capability classes to their correct definitions. Write the correct class numbers in the blanks. Definitions continue on the next page.

_____a. Land with soils having little or no erosion hazards but having other limitations that are impractical to remove and limit use largely to pasture, range, woodland, or wildlife food and cover; hazards include very poor drainage with wet, poorly drained profiles or frequently flooded areas

_____b. Land with soils having severe limitations that reduce the choice of plants or require moderate conservation practices

_____c. Land with soils having severe limitations that make it unsuited for cultivation and restricts use to pasture, range, woodland, or wildlife food and cover

_____d. Land with soils or land forms having limitations that preclude use to commercial plant production and restrict use to wildlife, recreation, water supply, or scenic purposes

_____e. Land with soils having few limitations that restrict use; overhead water does not change land class; treatment is usually on adjacent soils

_____f. Land with soils having severe limitations that reduce the choice of plants, require special conservation practices, or both

Class I
Class II
Class III
Class IV
Class V
Class VI
Class VII
Class VIII

TEST

______g. Land with soils having severe limitations that restrict the choice of plants, require very careful management and special conservation, or both

______h. Land with soils having very severe limitations that make it unsuited for cultivation and restricts use to grazing, woodland, or wildlife

26. Match land-capability class(es) to their correct suitable uses. Write the correct class numbers in the blanks. Some blanks may contain more than one correct answer.

_________a. Land suited for cultivation as well as uses such as grazing, forestry, or wildlife food and cover

_________b. Land not suited for cultivation, grazing, or forestry, but suited for uses such as wildlife, recreation, water supply, or scenic purposes

_________c. Land not suited for cultivation, but suited for uses such as grazing, forestry, or wildlife food and cover

Class I
Class II
Class III
Class IV
Class V
Class VI
Class VII
Class VIII

27. Select the best land-capability class possible for each of the soil factors listed below. Write the correct class numbers in the blanks. Some answers will be used more than once. Soil factors continue on the next page.

Texture

______a. Coarse
______b. Moderately coarse
______c. Medium
______d. Moderately fine
______e. Fine

Depth

______a. Deep
______b. Moderately deep
______c. Shallow
______d. Very shallow

Class I
Class II
Class III
Class IV
Class V
Class VI
Class VII
Class VIII

TEST

Permeability

______a. Rapid

______b. Moderate

______c. Slow

______d. Very slow

Slope

______a. Nearly level (0% to 1%)

______b. Gently sloping (1% to 3%)

______c. Moderately sloping (3% to 5%)

______d. Strongly sloping (5% to 8%)

______e. Steep (8% to 15%)

______f. Very steep (15% and over)

Erosion

______a. None to slight

______b. Moderate

______c. Severe

______d. Very severe

Surface runoff

______a. Rapid

______b. Moderate

______c. Slow

______d. Very slow

28. List types of recommended land treatments applied to land-capability classes.

a. ____

b. ____

c. ____

TEST

29. Match types of vegetative practices to the correct land-capability class(es) each is applied to. Write the correct class numbers in the blanks. Answers will be used more than once, and some blanks may contain more than one correct answer.

________a. Row cropping with occasional soil-conserving crop

________b. Row cropping with frequent soil-conserving crop

________c. Row cropping not more than two out of five years

________d. Row cropping not more than one out of five years

________e. Returning crop residue to soil

________f. Practicing conservation tillage

________g. Establishing recommended grass or grasses and legumes

________h. Practicing proper pasture and range management

________i. Protecting vegetation from burning

________j. Practicing control grazing

________k. Planting recommended trees

________l. Practicing selective harvesting

________m. Establishing wildlife or recreation areas

Class I
Class II
Class III
Class IV
Class V
Class VI
Class VII
Class VIII

30. Match types of mechanical treatments to their correct uses. Write the correct numbers in the blanks. Treatments and uses continue on the next page.

______a. Used on all land-capability classes except Class VIII

______b. Used where wetness is a factor

______c. Used when brush and trees, erosion, gullies, drainage, or outside water are *not* problems

______d. Used when active gullies are a problem

1. Controlling gullies
2. No treatment needed
3. Controlling brush and trees
4. Installing drainage system

TEST

_____e. Used on land-capability Classes II, III, and IV (depending on soil, slope, cover, erosion, and intensive use)

_____f. Used any time terracing and farming on contour are recommended

_____g. Used whenever field has overhead water problem

5. Maintaining terraces
6. Constructing diversion terraces
7. Terracing and farming on contour

31. State types of fertilizer applications applied to each of the soil types listed below.

    a. Soil with a pH of 6.0 ____

    b. Soil with a phosphate level of 60 pounds per acre ______________________

    c. Soil with a potassium level of 200 pounds per acre _____________________

    d. Soil with a deficiency of nitrogen ______________________________

32. Match factors that may influence land-capability class to the correct land treatment applied to each. Write the correct numbers in the blanks. Some blanks may contain more than one correct answer.

_____a. Installing drainage system

_____b. Planting recommended trees, practicing selective harvesting of trees; protecting from burning

_____c. No mechanical treatment applies

_____d. Planting recommended trees; protecting from burning

_____e. Constructing diversion terraces

1. Wetness
2. Frequently flooded
3. Overhead water
4. Needs windbreak
5. Desires post lot or wood lot
6. Timber production

(NOTE: Test items 33 through 37 list the assignment sheets and job sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

33. Determine degree of erosion.

34. Complete a soil-classification worksheet.

35. Complete a recommended-land-treatment worksheet.

36. Determine land-capability classes and select land treatments.

37. Demonstrate the ability to

    a. Determine soil texture by feel.

    b. Use a slope finder to determine slope.

SELECT SOIL-CONSERVATION PRACTICES
UNIT II

ANSWERS TO TEST

1.

a.	13	l.	1
b.	11	m.	12
c.	2	n.	3
d.	7	o.	21
e.	9	p.	22
f.	5	q.	20
g.	10	r.	18
h.	14	s.	17
i.	6	t.	16
j.	4	u.	15
k.	8	v.	19

2. Outer layer of earth's crust made up of mineral and organic matter capable of supporting plant growth

3. a. Mineral matter
   b. Water
   c. Air
   d. Organic matter

4. Answer should include any four of the following

   a. Makes soil porous
   b. Supplies nutrients to plants
   c. Holds water in soil
   d. Furnishes food for soil organisms
   e. Stores mineral nutrients
   f. Reduces leaching
   g. Stabilizes soil structure

5. b, c, e, f

6. Answer should include any four of the following

   a. Type of parent material present
   b. Amount of weathering soil is exposed to
   c. Climate soil is exposed to
   d. Types of plant and animals present
   e. Amount of slope and drainage at location

ANSWERS TO TEST

7. Answer should include any four of the following
   - a. Helps you understand the importance of basic soil differences as they affect crop production, erosion, and homesite selection
   - b. Helps you determine management practices important to proper use of soil and water
   - c. Develops your understanding of different soil- and water-conservation practices
   - d. Helps you understand the influence of land features on production and land protection
   - e. Helps you select a farm for lease or purchase

8. Answer should include any four of the following
   - a. Surface texture
   - b. Depth of soil (horizons)
   - c. Slope
   - d. Erosion
   - e. Permeability
   - f. Surface runoff

9. a. Size of soil particles comprising soil
   - b. Relative proportion of soil particles in soil
   - c. Structure of soil
   - d. Color of soil

10. a. Sand
    - b. Silt
    - c. Clay

11. a. 3
    - b. 2
    - c. 1

12. a. 1
    - b. 4
    - c. 3
    - d. 5
    - e. 2

13. a. 4
    - b. 2
    - c. 6
    - d. 1
    - e. 3
    - f. 5

14. a. 1
    - b. 3
    - c. 2
    - d. 4

ANSWERS TO TEST

15. a. 2
b. 3
c. 1

16. a. 2 c. 4
b. 1 d. 3

17. a. 1 d. 5
b. 4 e. 3
c. 6 f. 2

18. a. Wind
b. Water

19. a. 3 c. 4
b. 1 d. 2

20. a. 2
b. 3
c. 1

21. Answer should include any three of the following

a. Providing water-control systems
b. Planting cover crops
c. Controlling gullies
d. Using fertilizer
e. Using land properly
f. Using conservation tillage

22. a, c, e, f, h, i, j, l, m

23. a. 2 c. 1
b. 4 d. 3

24. a. 3 c. 1
b. 4 d. 2

ANSWERS TO TEST

25. a. V
    b. II
    c. VI
    d. VIII
    e. I
    f. III
    g. IV
    h. VII

26. a. I, II, III, IV
    b. VIII
    c. V, VI, VII

27.

Texture	**Permeability**	**Erosion**
a. III	a. III	a. I
b. I	b. I	b. II
c. I	c. I	c. VI
d. I	d. II	d. VI
e. I		

Depth	**Slope**	**Surface runnoff**
a. I	a. I	a. III
b. I	b. II	b. I
c. III	c. III	c. I
d. VII	d. IV	d. II
	e. VI	
	f. VI	

28. a. Vegetative practices
    b. Mechanical treatments
    c. Fertilizer applications

29. a. I
    b. II
    c. III
    d. IV
    e. I, II, III, IV
    f. I, II, III, IV
    g. V, VI, VII
    h. V, VI, VII
    i. V, VI, VII, VIII
    j. V, VI, VII
    k. VIII
    l. VIII
    m. VIII

30. a. 3
    b. 4
    c. 2
    d. 1
    e. 7
    f. 5
    g. 6

ANSWERS TO TEST

31. a. Soil amendment (lime)
    b. Nothing
    c. Potassium (K_2O)
    d. Nitrogen

32. a. 1
    b. 5, 6
    c. 2
    d. 4
    e. 3

33. Evaluated to the satisfaction of the instructor

34. Evaluated to the satisfaction of the instructor

35. Evaluated to the satisfaction of the instructor

36. Evaluated to the satisfaction of the instructor

37. Performance skills evaluated to the satisfaction of the instructor

EVALUATE PLANT GROWTH AND REPRODUCTION
UNIT III

UNIT OBJECTIVE

After completing this unit, the student should be able to discuss classifications and life cycles of plants and explain how plant parts and processes are associated with plant growth and reproduction. The student will show this ability by completing the assignment sheet, job sheet, and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with plant growth and reproduction.
2. Arrange in order the stages in the life cycle of plants.
3. Match to their correct descriptions plant classifications based on life-cycle patterns.
4. Discuss plant classifications based on agricultural use.
5. Label the parts of a legume.
6. Match the four basic plant parts to their correct functions.
7. Name and describe root types.
8. Identify parts of a stem.
9. Describe monocot and dicot leaf types.
10. Name and describe dicot leaf-to-stem attachment patterns.
11. Distinguish between the vascular functions of phloem and xylem.
12. Match to their correct definitions terms associated with flowers.
13. Label the parts of a flower.
14. Arrange in order the steps in plant sexual reproduction (seed production).
15. Match to their correct descriptions plant asexual (vegetative) reproduction methods.
16. Arrange in order the stages in the seed germination process.
17. Select from a list requirements for good germination.

OBJECTIVE SHEET

18. List factors that cause poor or no germination.
19. State and explain the formula for photosynthesis.
20. Evaluate common agricultural plants.
21. Demonstrate the ability to germinate seeds.

EVALUATE PLANT GROWTH AND REPRODUCTION
UNIT III

SUGGESTED ACTIVITIES

I. Unit contents

   A. Objective sheet

   B. Suggested activities

      1. Supplements

         a. Supplement #1 — Root-View Box

         b. Supplement #2 — Discussion Questions

         c. Supplement #3 — Rhizobia Inoculation of Legume Seeds

      2. Transparency masters

         a. TM #1 — Parts of a Legume

         b. TM #2 — Root Types

         c. TM #3 — Parts of a Stem

         d. TM #4 — Parts of a Flower

   C. Information sheet

   D. Assignment Sheet #1 — Evaluate Common Agricultural Plants

   E. Answers to assignment sheet

   F. Job Sheet #1 — Germinate Seeds

   G. Test

   H. Answers to test

II. Instructor's guide

   A. Read unit and prepare presentation.

   B. Obtain materials to supplement unit.

      1. Equipment and materials needed to complete Job Sheet #1.

      2. Slide sets

         a. *The Western Fertilizer Handbook Slide Set Series #3*, "Principles of Plant Growth"

SUGGESTED ACTIVITIES

(NOTE: This series is available from Vocational Education Productions, California Polytechnical State University, San Luis Obispo, California 93407. Call toll-free 1-800-235-4146, and order slide set 1-580-603D, which, at this printing, costs $32.95.)

b. AGRO4 — *Leaf Characteristics of Grasses and Legumes*, 61 slides with tape, $82.50

c. AGRO7 — *Crop Pollination*, 27 slides with tape, $36.50

d. AGRO12 — *Germination and Seedling Development of Grasses*, 44 slides with tape, $59.50

e. AGRO13 — *Germination and Seedling Development of Legumes*, 30 slides with tape, $40.50

(NOTE: Slide shows *b* through *e* are available from Reinforcement Agri-Media, University of Minnesota Media Distribution, Box 734 Mayo Memorial Building, 420 Delaware Street, S.E., Minneapolis, Minnesota 55455; phone 612-376-8340.)

3. Slide projector
4. Examples of root, stem, flower, and cotyledon types
5. Microscopes and prepared slides of phloem and xylem tissues
6. Transparencies
7. Competency profiles

(NOTE: Transparencies and competency profiles for this book are available from the State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Read Supplement #1 closely and determine whether or not you want to build a root-view box. If you do decide to build the box or boxes, begin seed germination immediately upon starting this unit so that students may see some results by the time the unit is completed.

D. Provide students with unit.

E. Introduce unit.

SUGGESTIONS:

- Discuss unit and specific objectives, pointing out that the specific objectives are basically a preview of the unit and are necessary in order to complete the unit objective, or goal, of the unit.
- Show "Principles of Plant Growth" from *The Western Fertilizer Handbook Slide Set Series*. Explain to students how they will be able throughout their lives to use the information contained in this unit.

SUGGESTED ACTIVITIES

F. Discuss information, assignment, and job sheets.

1. Use Information Sheet, Sections I and II to discuss terms and definitions associated with plant growth and reproduction and the life cycle of plants.

   SUGGESTIONS:

   - Tell the students that the life cycle of a plant may seem rather simple, but it is important to have an understanding of how plants grow and reproduce.
   - Show students examples of monocotyledons and dicotyledons.
   - Make a bulletin board display showing self-pollination, cross-pollination, and fertilization.
   - Make a bulletin board display showing photosynthesis and containing the formula for photosynthesis.

2. Use Information Sheet, Sections III and IV to introduce students to plant classifications based on life-cycle patterns and agricultural use.

   SUGGESTIONS:

   - As plant classifications are discussed, have a student make a list across the top of the chalkboard of common crops in your community. Then, under each crop name, have the student list the ways that these crops are classified. Leave this chart on the chalkboard so that later on in the unit, the list can include root type, cotyledons, type of flower, and methods of reproduction.
   - Expand your discussion of classifications to include examples of locales for various crops grown in the United States. Refer to the unit on analyzing the crop industry for crop-production localities in Oklahoma; find national statistics in a crop-production text.

3. Use Information Sheet, Section V to help students identify the parts of a legume.

   SUGGESTIONS:

   - Use Transparency #1 to illustrate your discussion.
   - Show students an actual legume.
   - Have both a legume and a grass plant in the classroom so that students may compare them.
   - Point out to students that the parts of a grass plant were covered in the Vo-Ag I curriculum. Review that material if necessary, illustrating your review with the transparency from that material.

SUGGESTED ACTIVITIES

4. Use Information Sheet, Sections VI through X to introduce students to the parts of plants.

   SUGGESTIONS:

   - Remember to continue the list on the chalkboard where appropriate.
   - Use Transparencies #2 and #3 to illustrate your discussion.
   - Show *Leaf Characteristics of Grasses and Legumes* in association with Section X.
   - Use actual plants to show students examples of the parts discussed.

5. Use Information Sheet, Section XI to discuss the vascular system of plants.

   SUGGESTIONS:

   - Set up some microscopes so that students may view and compare actual tissue types (phloem and xylem).
   - Compare a plant's vascular system to a transportation system. Phloem and xylem cells are the vehicles that transport food and energy.

6. Use Information Sheet, Sections XII and XIII to teach parts of flowers and terminology associated with flowers.

   SUGGESTIONS:

   - Carefully locate each of the flower parts on an actual flower in the classroom.
   - Use Transparency #4 to illustrate your discussion.
   - Discuss and give examples of all sorts of complete, incomplete, perfect, and imperfect flowers, particularly as they relate to agricultural crops. Have the student at the chalkboard continue adding to the lists.

7. Use Information Sheet, Sections XIV and XV to discuss methods of plant reproduction.

   SUGGESTIONS:

   - Refer students to terms and definitions in Section I as the terms are encountered.
   - Show slide/tape show *AGRO7 Crop Pollination*.
   - Show students a sample of bermuda grass that exhibits vegetative reproduction with both stolons and rhizomes.

SUGGESTED ACTIVITIES

8. Use Information Sheet, Sections XVI through XVIII to begin the study of seed germination.

   SUGGESTIONS:

   - Show slide/tape shows *AGRO12—Germination and Seedling Development of Grasses* and *AGRO13—Germination and Seedling Development and Legumes*. Have students take notes on the two slide/tape shows, and then follow up with a class discussion of the differences.
   - Provide students with Supplement #3.
   - Use Question #3 in Supplement #2 if desired.
   - Study the stages of germination as they exist in the root-view box or boxes.
   - Apply some of the factors that cause poor or no germination to the seeds in the root-view box. Note results and discuss.
   - Allow students to conduct their own germination test by completing Job Sheet #1. Be sure to follow up the germination experiment, even if the class has moved to another unit of instruction when the seeds have germinated.

9. Use Information Sheet, Section XIX to introduce students to the formula for and the concept of photosynthesis.

   SUGGESTIONS:

   - Introduce the discussion by pointing out that once the seed has germinated, the seedling exists, and the stored food has been used, then the young plant must begin to manufacture its own food. This process is called *photosynthesis*.
   - Experiment with seedlings by removing one of the factors needed for photosynthesis and observing the results.

10. Introduce Assignment Sheet #1 and discuss with students how you intend to use the assignment sheet.

    SUGGESTIONS:

    - Allow students to use the list on the chalkboard as a means of completing the assignment sheet.
    - The assignment sheet could be used as a set of open-book summary questions.

G. Review unit and give test.

SUGGESTED ACTIVITIES

H. Critique test and discuss in class.

I. Complete appropriate section of competency profiles.

III. Unit references

A. Bishop, Douglas D., et. al. *Crop Science and Food Production*. New York: Gregg Division of McGraw-Hill Book Company, 1983.

B. Delorit, Richard J., Louis J. Greub, and Henry L. Ahlgren. *Crop Production*, 4th ed. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1974.

C. Richardson, William B., and Gary E. Moore. *Working in Horticulture*. New York: McGraw-Hill Book Company, 1980.

D. Tenney, Richard W., Carol L. Zimmerman, and Daryle E. Foster. *Innovative Teaching Ideas*. Ithaca, New York: Cornell Institute for Occupational Education, 1976.

SUGGESTED ACTIVITIES

SUPPLEMENT #1 — ROOT-VIEW BOX

With a box designed to bring the below-ground action of plants into view, the plant world takes on a new dimension. Roots and tops are seen as one. Roots develop rapidly. There is day-to-day change to sustain interest. One way to make the box is diagramed on the following page. The dimensions are not critical. The box can be any length. To get full exposure of root growth, the window or viewing side of the box must be slanted enough to force the roots to grow against the window. With two boxes, you can compare growth in different soils or with different rates or methods of fertilizing.

To make sure of success, use one of the scientifically blended soil mixes such as Jiffy-Mix, Peat-Lite, Redi-Earth, U.C. Mix, Super Soil, or Pro-Mix. Thoroughly dampen the mix before filling the box. Fill to near the top and water thoroughly to settle the soil. Sow seeds 1/4 inch from glass or plastic. Cover the box with a plastic film to slow evaporation, and moisten the top of the soil when it becomes dry. Because roots of many plants tend to grow away from the light source, cover the window with a wood panel or dark cloth except at viewing times. Boxes can be used to show many features:

1. How roots develop in an ideal soil.
2. How roots develop in a problem soil.
3. How water moves through various soils.
4. How plants respond to fertilizers.

With two or more boxes, you can set up a number of soil tests. For example, you can compare plant growth of lettuce in the synthetic soil with growth in your garden soil or with your garden soil mixed with compost or other organic matter. Or, you might test one method of fertilizing against another. For example, try fertilizing with a liquid fertilizer at the rate and frequency called for on the label in one box, and in the other apply half the amount called for but twice as often.

Observation of the root growth of tomato transplants will reveal a lot about planting tomatoes. Plant one as you would any other vegetable, and in the same box plant another deep in the soil. Watch to see if roots form all along the buried stem as well as spreading out from the root ball.

Experiments in rooting cuttings will demonstrate another reproductive method. A piece of geranium or coleous stuck into the planter mix will form roots and produce a duplicate of its mother. In growing cuttings, cover the box with polyethylene film to prevent cuttings from drying out.

After the box has been in use for a month, some light fertilization will be necessary. Use a liquid fertilizer at the rate called for on the label.

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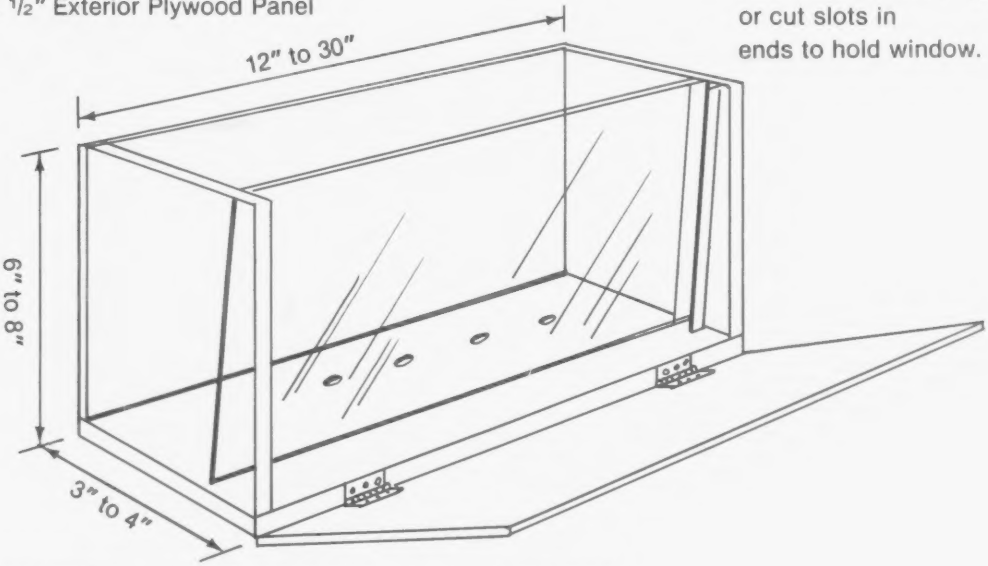
SUPPLEMENT #1

To Build a Root-View Box

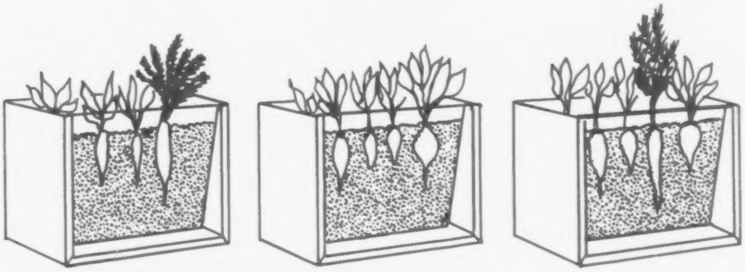
Back: 1/2" Exterior Plywood Panel

Use 1/4-round molding or cut slots in ends to hold window.

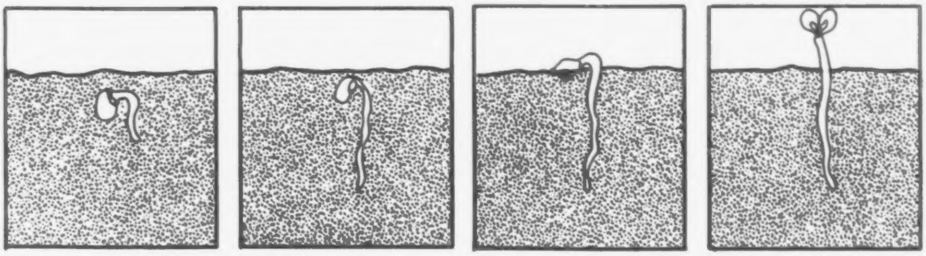


Ends and Bottom—1" Cedar, Redwood, or Exterior Plywood

To keep light and heat off the roots when you are not viewing them, make another slot to hold a plywood or cardboard panel in front of the viewing window. . .or hinge a panel to the front that will fold up and cover the window.



A Root Race



SUGGESTED ACTIVITIES

SUPPLEMENT #2 — DISCUSSION QUESTIONS

(NOTE: The following discussion questions are presented as optional material for the instructor to use in classroom discussions. The material relates to this unit, but goes into more detail than the unit does.)

1. **Winter wheat plants can be grazed by cattle during the fall and still produce normal heads from the apical buds the next spring. Why?**

   During fall growth, the apical buds of wheat are protected within the crown, which is just below the soil surface. Grazing animals only remove leaf blades and sheaths and do not damage the apical buds. Spike (head) development does not occur until the next spring because the plant requires a period of cold temperature to trigger spike initiation. This process is called *vernalization*.

2. **Bermuda grass and bromegrass appear as a solid, continuous turf, while tall fescue and little bluestem appear as clumps or bunches. Why?**

   Bromegrass has rhizomes (below-ground stems) and bermuda grass has both rhizomes and stolons (aboveground stems) that produce new shoots and roots from nodes at some distance from the parent plant. As these modified stems develop extensively and send up many shoots, a solid turf is established. Tall fescue and little bluestem have no such creeping stems and can spread only by seed or by producing more tillers (additional stalks) from the crown. Thus, older plants may have many tillers from a single plant, but they remain in distinct clumps or bunches.

3. **Wheat and barley can generally emerge from a deeper planting depth than soybeans or peanuts. Why?**

   Wheat and barley exhibit hypogeal emergence, the cotyledons do not emerge above the surface of the soil. Soybeans and peanuts exhibit epigeal emergence, the cotyledons rise above the surface of the soil. Epigeal emergence takes more energy than hypogeal emergence, and if these seeds are planted too deeply, they are more likely to run out of energy before emerging.

4. **Potato, sweet potato, and sugarcane are all propagated for commercial production by means other than seed. What propagation method is used for each?**

   The potato is propagated with pieces of the underground storage stem (tuber), which develop adventitious shoots and roots from the nodes (eyes). In the case of the sweet potato, one end of the storage root develops several adventitious shoots with roots (slips), which are then transplanted into the soil. Sugarcane propagation requires that sections of the aboveground stem (sets) are planted in the soil where they sprout shoots from axillary buds and also develop adventitious roots at the nodes.

SUPPLEMENT #2

5. **Producers of alfalfa and clover seed must be very cautious about applying insecticides for control of insect pests near flowering plants. Why?**

   Even though their flowers are perfect, alfalfa and most clovers are naturally cross-pollinated (often due to self-sterility mechanisms) and depend on insects (honey bees, leaf-cutter bees, etc.) to transfer pollen from one flower to another to ensure pollination and seed set. Insecticides to control insect pests may also injure the essential beneficial pollinator insects.

6. **A hailstorm occurs four weeks after soybean and sorghum seedlings have emerged. The sorghum recovers but the soybeans do not. Why?**

   Sorghum is a grass plant in which the seedling has an apical bud protected within the crown near the soil surface. Rapid stem growth does not start until floral initiation, thus the apical bud stays close to the soil surface during vegetative growth. The hail probably did not harm the apical bud. Even if the apical bud was removed, axillary buds from the protected crown could develop tillers (additional stalks from the same plant.) In soybeans, the growth of the hypocotyl pushes the apical bud well above the soil surface at emergence, and it continues to be exposed at the tip of the plant throughout the season. Therefore, it is easily removed by hail. Axillary buds are also all above ground in the soybean, and if the plant is cut below the cotyledons, it has no chance of regrowing.

7. **One week after a 6-inch rainfall, wheat plants start dying in the low areas of a farmer's field. The wheat was 3 feet tall and was just starting to flower. Why is it dying?**

   The excess water in the soil is probably restricting the aeration to the plants' root systems. Roots need air from which to obtain oxygen for respiration. Without air, the roots stop functioning, and in a short period of time the tops will also die.

8. **Cotton requires irrigation to a greater depth than does wheat. Why?**

   Cotton has a taproot system while wheat has a fibrous-root system. Taproots grow much deeper in the soil, and, therefore, water must be moved deeply into the soil to be present where the roots are concentrated. Wheat, with a fibrous-root system, has most of its roots concentrated in the upper 2 to 3 feet of the soil and does not have to be watered as deeply.

SUGGESTED ACTIVITIES

SUPPLEMENT #3 — RHIZOBIA INOCULATION OF LEGUME SEEDS

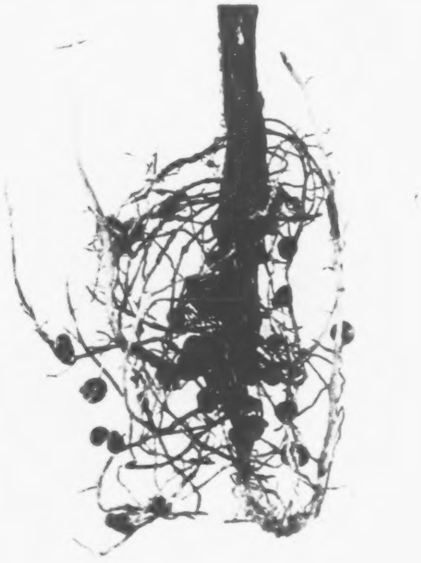
Legumes are very important sources of protein to humans and animals; therefore, success in growing legumes is very important. Inoculating the legume seed is a primary step toward the crop's success. To thoroughly explain the inoculation of legume seeds, a discussion of nitrogen fixation, rhizobia, nodule formation, and the following terms is required.

- **Ammonium**—Stable, reduced form of nitrogen that can be absorbed and used by plants
- **Nitrogen fixation**—Process of transforming atmospheric nitrogen (N_2) into ammonium (NH_4+); may be performed industrially or by rhizobia bacteria
- **Rhizobia**—Strain of bacteria capable of forming nodules on legume roots and then performing nitrogen fixation
- **Nodules**—Small, pealike enlargements on legume roots in which rhizobia live
- **Inoculation**—Process of adding rhizobia to legume seeds prior to planting or during planting

Nitrogen fixation through the buddy system

The process of nitrogen fixation is important to legumes because the plants require a high rate of nitrogen for their production of protein. The nitrogen in the atmosphere is too complex to be used by plants; therefore, legumes use the buddy system with rhizobia to obtain usable nitrogen.

The buddy system includes a strain of rhizobia bacteria and the legume. The rhizobia bacteria are capable of nitrogen fixation. They attach themselves to the legume's root system and form small, pealike nodules in which they live. (See photo of nodules below.)



SUPPLEMENT #3

Once the nodules have formed, the plant provides the rhizobia with food and the rhizobia begin to provide the plant with nitrogen (ammonium). In fact, the rhizobia actually produce more nitrogen than the legume needs, thus they create usable nitrogen for other plants. The rhizobia produce so much nitrogen that given the right plant stand, soil conditions, and environment, there may be 50 to 200 additional pounds of plant-available nitrogen released into the soil annually.

Legume inoculation groups

For practical purposes, common legumes are grouped according to their association with certain strains or species of rhizobia. The "cross inoculation" groups listed below can be inoculated with the same kind of rhizobia.

- **Alfalfa group**

  Alfalfa, sweet clover, bur clover, black medic

- **Clover group**

  Red clover, white clover, alsike clover, crimson clover

- **Pea and vetch group**

  Field peas, canning or garden peas, vetch

- **Bean group**

  Field beans, kidney beans, scarlet runner beans

- **Cowpea group**

  Cowpeas, lespedeza, peanuts, kudzu, velvet beans, lima beans

- **Soybean group**

  Soybeans

- **Lupine group**

  Lupines, serradella

Inoculation mediums

The rhizobia bacteria may be mixed with one of three common bases prior to mixing with or inoculating the seed. The three most common bases are agar (jelly), peat (powder), and liquid. The bacteria thrive in these mediums and the mediums bind to the seeds, thus ensuring inoculation. Farmers may either inoculate the seed prior to planting, in which case the seeds must be planted within two days, or during the planting process. Both systems result in more thrifty, healthy-looking plants.

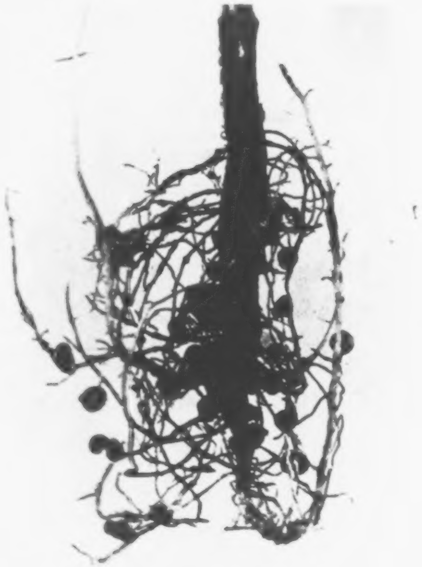
SUPPLEMENT #3

In recent years, seed firms have developed industrial methods of preinoculating legume seeds. Preinoculated seed remains viable for a long period of time if stored properly. The farmer should consult the supplier for the maximum storage period to ensure inoculant effectiveness.

Nodule formation

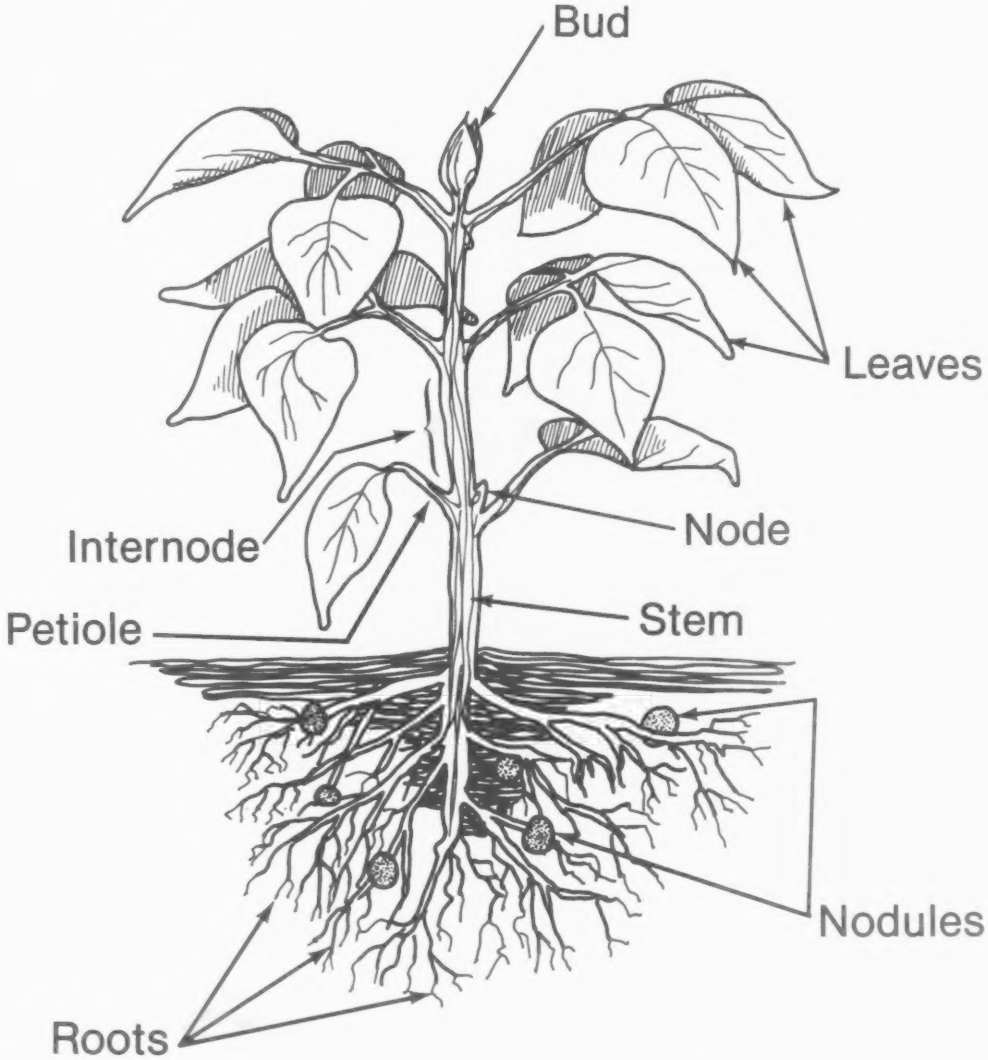
Once the seed has been inoculated and planted, the rhizobia become invaders to the plant's root system. They take food from the plant and form nodules on the roots. As the nodules mature, the rhizobia begin to perform the process of nitrogen fixation. To check the effectiveness of the nodules, follow the steps below.

1. Dig up a few legume plants
2. See if there are large nodules near the primary root or taproot (See photo below.)

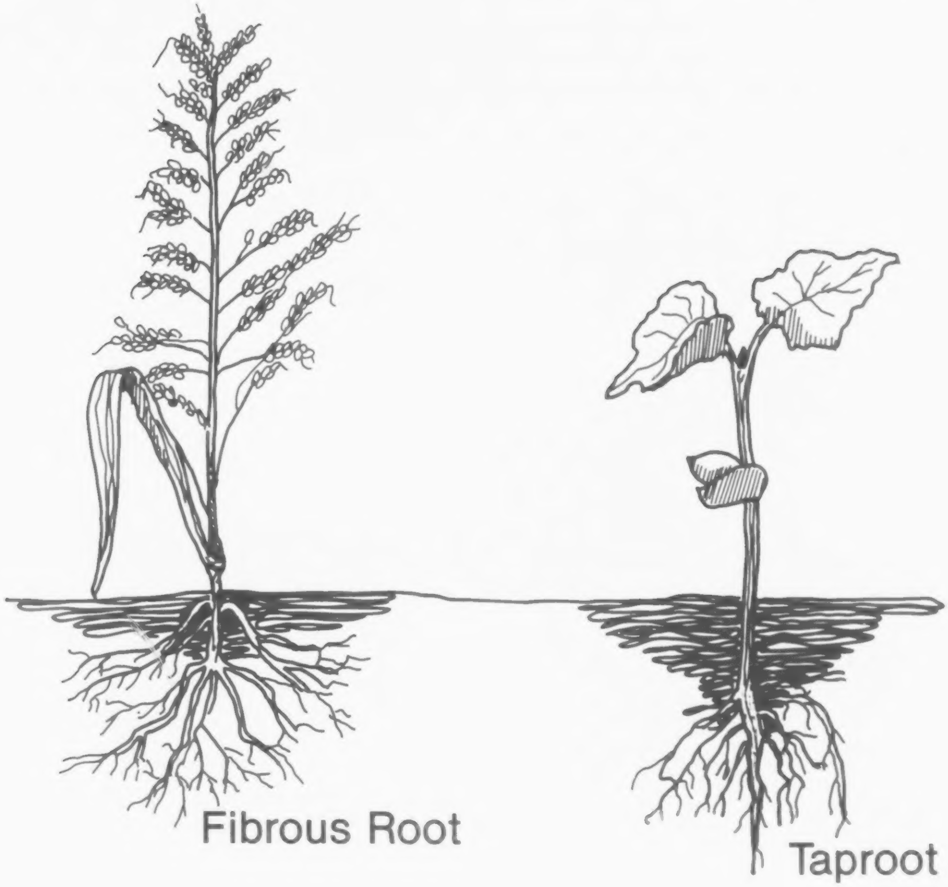


3. Cut the nodule in half; if the inside is pink, the nodule is effective

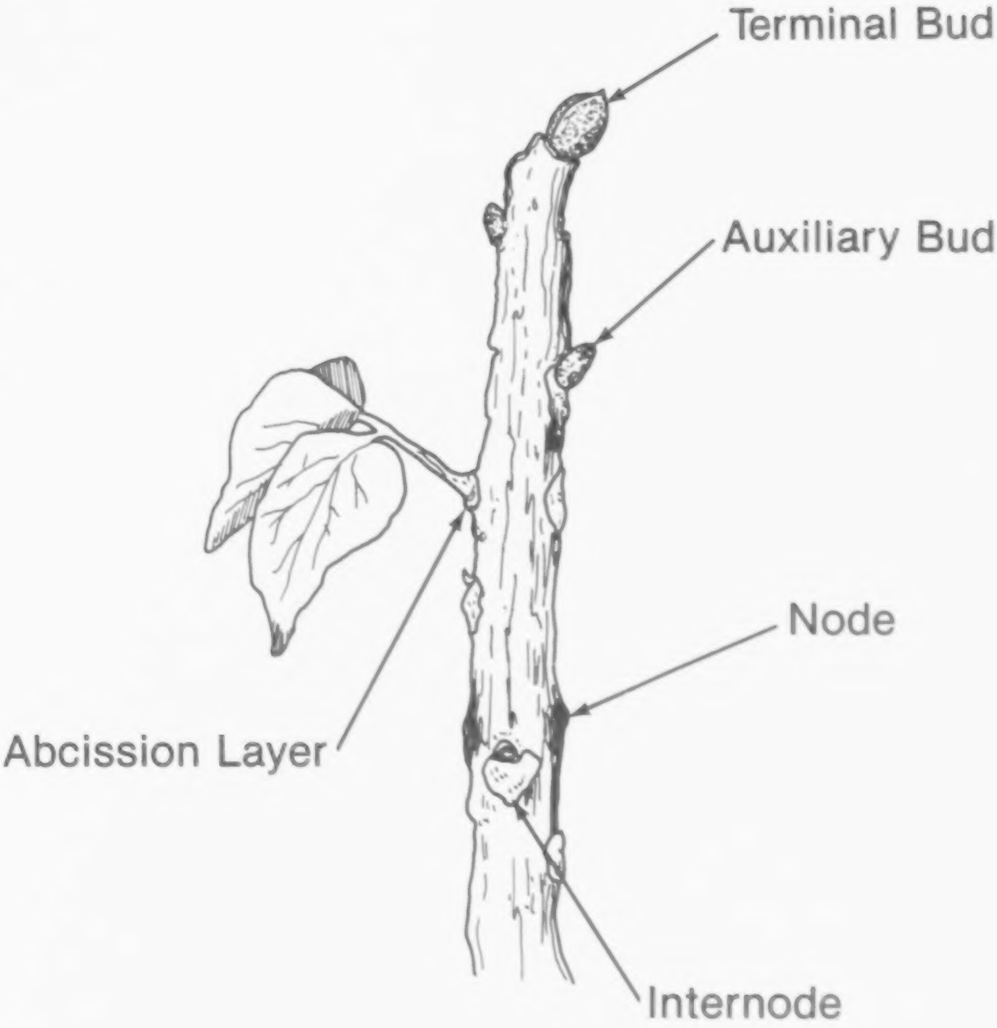
Parts of a Legume


Bud
Leaves
Internode
Node
Petiole
Stem
Nodules
Roots

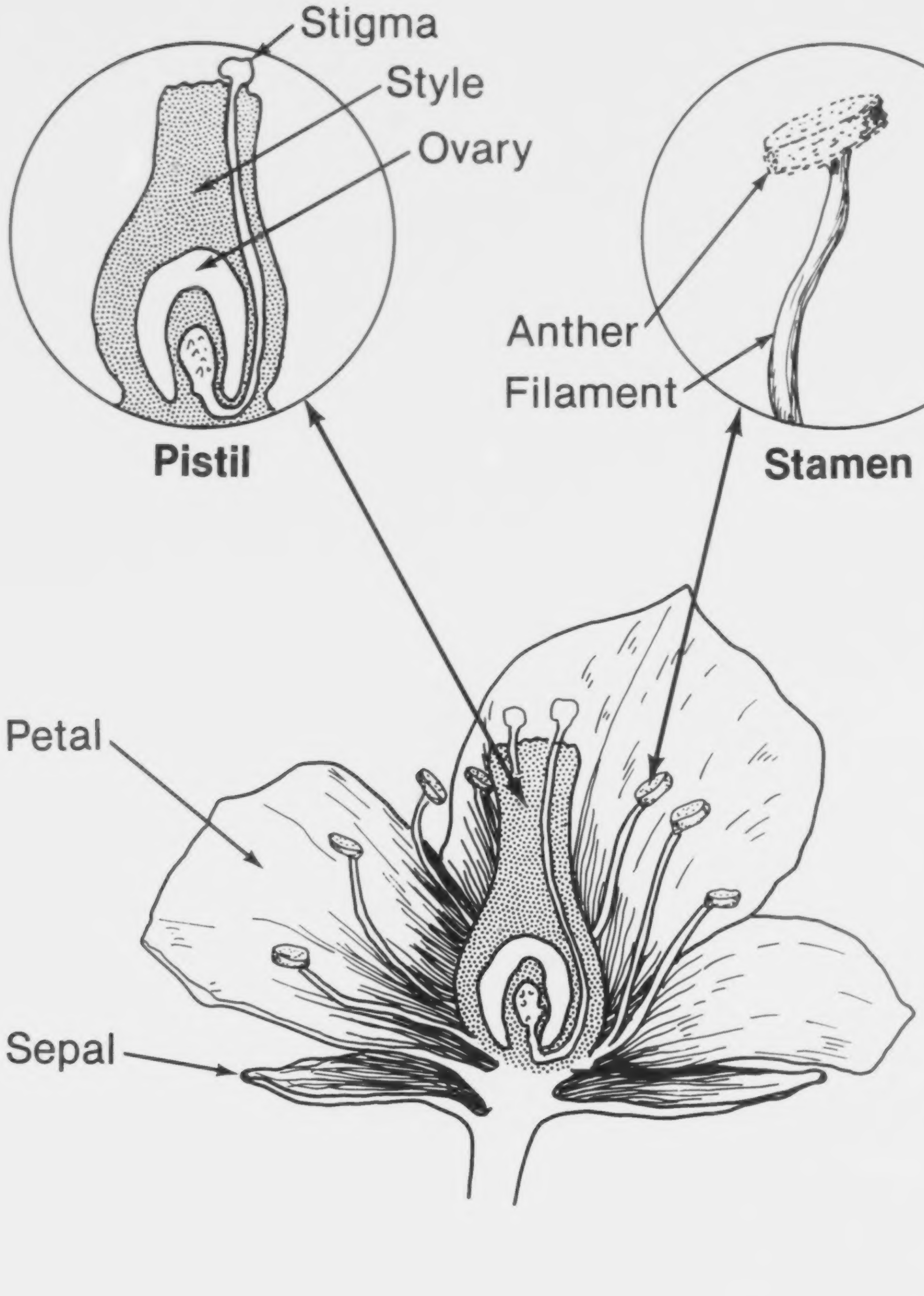
Root Types


Fibrous Root
Taproot

Parts of a Stem


Terminal Bud
Auxiliary Bud
Node
Abcission Layer
Internode

Parts of a Flower


Stigma
Style
Ovary
Pistil
Anther
Filament
Stamen
Petal
Sepal

EVALUATE PLANT GROWTH AND REPRODUCTION
UNIT III

INFORMATION SHEET

I. Terms and definitions associated with plant growth and reproduction

A. Cotyledon (seed leaf) — Leaf at first node of primary stem

B. Monocotyledon (monocot) — Plant producing one cotyledon

(NOTE: Monocotyledon plants are commonly referred to as *grasses*. Examples include corn, wheat, oats, rye, and barley.)

C. Dicotyledon (dicot) — Plant producing two cotyledons

(NOTE: Dicotyledon plants are represented by legumes. Dicotyledonous families of plants other than legumes include flax, cotton, Irish potatoes, and buckwheat.)

D. Pollination — Transfer of pollen from anther to stigma; one step in plant breeding process

E. Fertilization — Union of sperm cells with egg cell, a plant breeding process necessary for the development of the embryo in most plants

F. Self-pollination — Transfer of pollen from anther to stigma of same flower or to any other flower of same plant

G. Cross-pollination — Transfer of pollen from anther of one plant to stigma of another plant

H. Chlorophyll — Pigment that gives plants their green color and is necessary for photosynthesis

I. Photosynthesis — Process by which in the presence of sunlight green living plants convert carbon dioxide and water to carbohydrates

J. Germination — Process in which a seed changes into a developing seedling

K. Legume — Nitrogen-fixing dicot in pea family with dry pods splitting along two sutures

EXAMPLES: Alfalfa, clovers, all beans and peas, peanuts

II. Stages in the life cycle of plants

(NOTE: In general terms, the complete life cycle in plants refers to the stages that occur from the time a seed is planted until a new seed is produced.)

INFORMATION SHEET

- A. Planting of seed
- B. Germination
- C. Emergence of seedling
- D. Vegetative growth
- E. Reproduction
- F. Production of seed
- G. Maturity
- H. Death or harvesting

III. Plant classifications based on life-cycle patterns

A. Annual — Germinates, grows, reproduces, matures, and dies within one year

EXAMPLES: Corn, oats, barley, spring wheat, rice, soybeans, cocklebur, common broomweed, pigweed

B. Winter annual — Germinates in fall, overwinters, matures, sets seed, and dies in spring or early summer

EXAMPLES: Winter wheat, winter barley, winter oats, winter rye, cheat, mustards, buckwheat

C. Biennial — Requires two years or two growing seasons to complete its life cycle

EXAMPLES: Sugar beet, sweet clover

D. Perennial — Survives more than two years (frequently indefinitely), usually producing seeds each year and then becoming dormant before starting new vegetative growth and repeating cycle

EXAMPLES: Alfalfa, Kentucky bluegrass, bermuda grass, johnson grass, orchard grass, smooth bromegrass, most native pasture grasses, bindweed, western ragweed, nut sedge

IV. Plant classifications based on agricultural use

(NOTE: There is considerable overlap in these classifications. For example, corn is a leading grain crop, yet when it is placed in a silo, it is considered a forage crop, and when used as a source of sugar, it is considered a sugar crop.)

A. Cereal or grain crops — Plants grown for their seed or grain to be used for food or feed

(NOTE: The term *small grain* is sometimes used to refer to wheat, oats, barley, rye, and rice; corn and grain sorghums are sometimes referred to as *coarse grains*, the opposite of small grains.)

B. Oil-seed crops — Plants grown for the vegetable oil and concentrated protein contained in the seed

INFORMATION SHEET

EXAMPLES: Soybeans, peanuts, cottonseed, sunflowers, corn

C. Forage and pasture crops — Plants grown for their leaf or plant parts and used as a livestock feed

EXAMPLES: Grasses and legumes cut for hay, "green chop," or silage

D. Root and tuber crops — Plants grown for their underground storage organs

EXAMPLES: *Root crops*: Sugar beets, turnips, rutabagas, sweet potatoes, mangels, and carrots

Tuber crops: Potatoes

E. Fiber crops — Plants grown for the materials they provide for clothing and shelter

EXAMPLES: Cotton, flax

F. Sugar crops — Plants grown for their sugar production

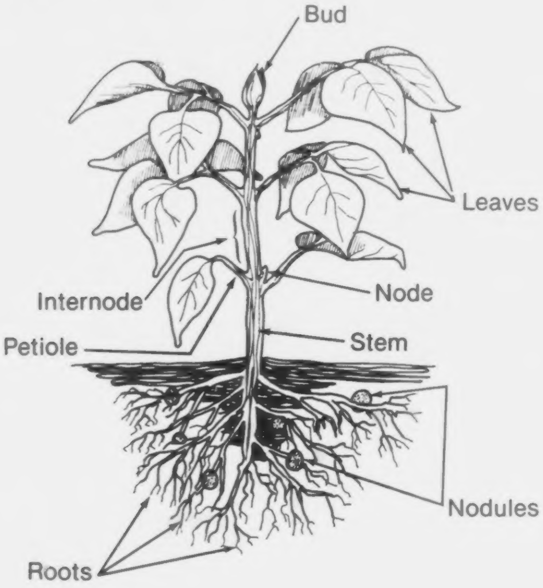
EXAMPLES: Sugar beets, sugarcane, corn

G. Special crops — Plants grown for a specific purpose; usually produced in smaller amounts than other crops

EXAMPLES: Tobacco, hops

V. Parts of a legume (Figure 1)

FIGURE 1



INFORMATION SHEET

VI. Functions of the four basic plant parts

A. Root

1. Anchors and supports plant
2. Absorbs water and minerals
3. Serves as overwintering structure for perennials
4. Stores food

B. Stem

1. Supports branches, leaves, flowers, seeds, and fruit
2. Aids in food manufacturing process
3. Stores food

C. Leaf

1. Manufactures food for plant
2. Absorbs carbon dioxide from air
3. Intercepts sunlight
4. Carries water and minerals from roots
5. Carries manufactured food to other parts of plant
6. Stores food

D. Bud or flower

1. Serves as site for reproduction
2. Stores food

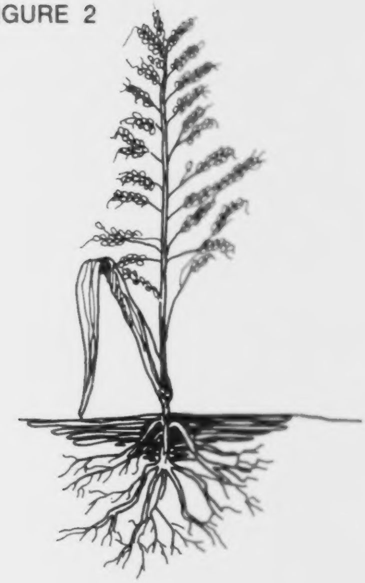
VII. Descriptions of root types (Figures 2 and 3)

(NOTE: The root system of a mature plant may occupy a space underground that is as large or larger than that occupied by the plant above ground. In corn, for example, the root system of a single plant may grow downward to a depth of 6 feet and spread outward over a diameter of 4 to 6 feet.)

A. Fibrous root — Very branched and finely divided; varying in depth from a few inches to 5 to 6 feet, depending on soil conditions; very effective in holding plant in place and preventing erosion on steep slopes; found in grasses and in many nongrass species

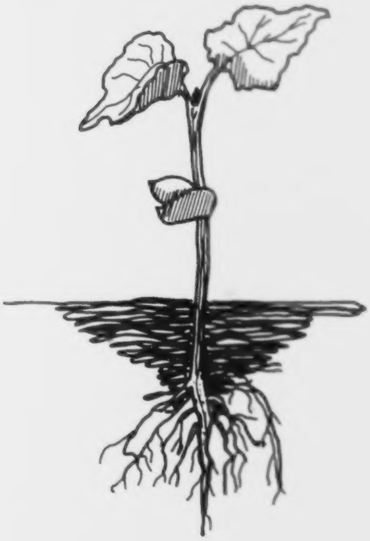
INFORMATION SHEET

FIGURE 2



B. Taproot — Penetrates to greater depth than other root type; has one central large root with small side-branching roots; central root creates advantage for plant to reach deeper soil moisture during dry periods; found in alfalfa, clovers, and carrots

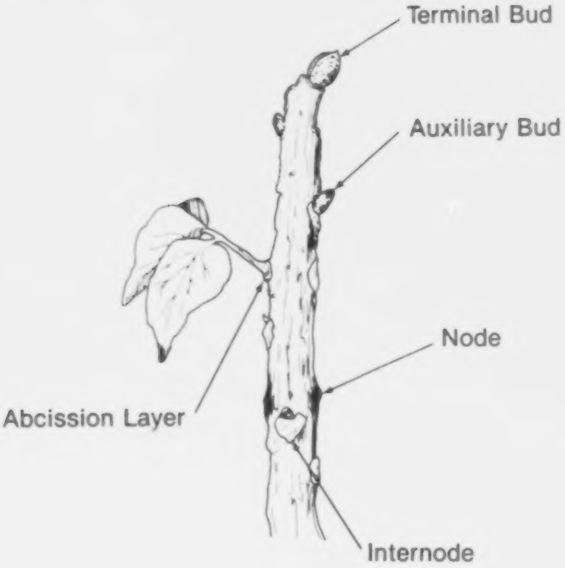
FIGURE 3



INFORMATION SHEET

VIII. Parts of a stem (Figure 4)

FIGURE 4

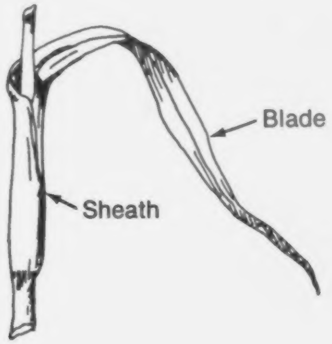

Terminal Bud
Auxiliary Bud
Node
Abcission Layer
Internode

IX. Monocot and dicot leaf types (Figures 5 and 6)

A. Monocot leaf — Composed of blade and sheath; blade usually long, narrow, thin, and pointed; sheath attaches blade to main stem

EXAMPLE:

FIGURE 5


Blade
Sheath

Source of Figure 5: *Crop Production*, by Richard J. Delorit, Louis J. Greub, and Henry L. Ahlgren, 1954.

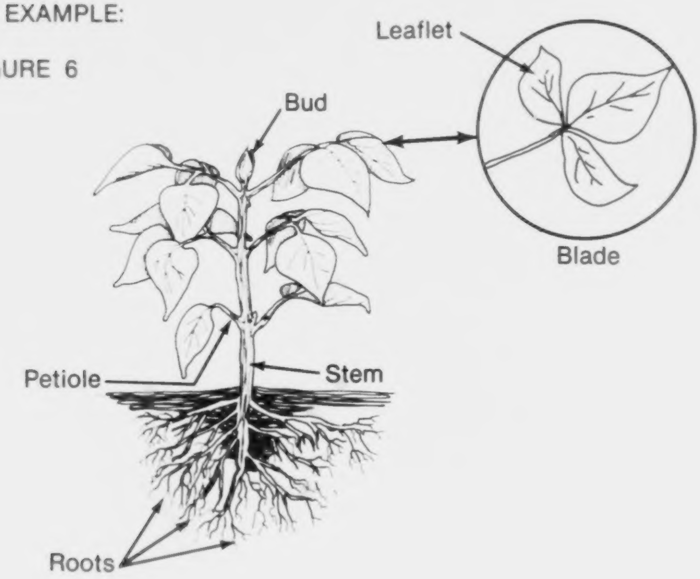
INFORMATION SHEET

B. Dicot leaf — Composed of blade and petiole; blade usually composed of two or more leaflets; petiole attaches blade to main stem

(NOTE: A dicot with the blade divided into two or more leaflets per petiole is called a *compound leaf*. The short stems connecting the leaflets to the petiole are called *petiolules*.)

EXAMPLE:

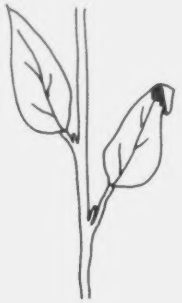
FIGURE 6



X. Dicot leaf-to-stem attachment patterns (Figures 7-9)

A. Alternate — One leaf at each node

FIGURE 7

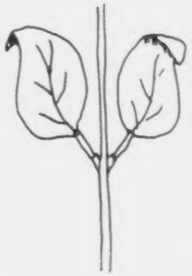


Source of Figures 7 through 9: *Crop Production*, by Richard J. Delorit, Louis J. Greub, and Henry L. Ahlgren, 1954.

INFORMATION SHEET

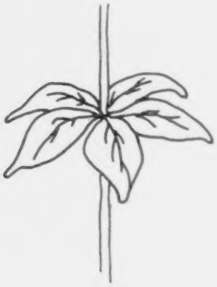
B. Opposite — Two leaves at each node, which are opposite each other

FIGURE 8



C. Whorled — Three or more leaves at each node

FIGURE 9



XI. Phloem and xylem, components of the plant's vascular system (See Figure 10)

(NOTE: Phloem and xylem are tissue types in a plant's vascular system, the functions of which roughly correspond to those of the circulatory system in animals.)

A. Xylem — Moves water and mineral elements from roots to all parts of plant

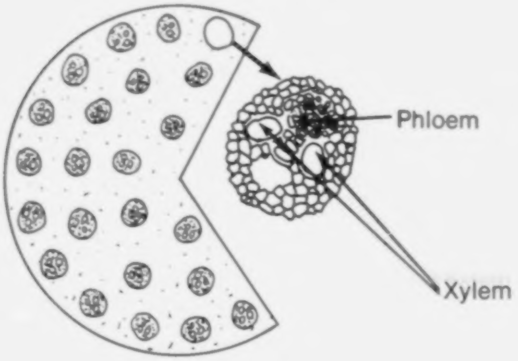
B. Phloem — Moves food manufactured in the leaves to all other parts of plant, including roots

(NOTE: Phloem tissue serves as a means of distributing chemicals such as weed killers to all parts of the plant. The process starts when the chemical is absorbed after being sprayed on the leaves.)

INFORMATION SHEET

EXAMPLE: Cross section through a monocot stem showing vascular bundles

FIGURE 10



Source of Figure 10: *Crop Production*, by Richard J. Delorit, Louis J. Greub, and Henry L. Ahlgren, 1954.

XII. Terms and definitions associated with flowers

(NOTE: The flower of a plant is vitally important because it is the organ of sexual reproduction in plants.)

A. Complete flower — Flower having all four principal parts: sepals, petals, stamens, and pistil

(NOTE: When sepals are considered as a unit, they are called a *calyx*; when petals are considered as a unit; they are called a *corolla*.)

B. Incomplete flower — Flower with one or more of its four principal parts missing

EXAMPLES: Flowers of the small grains (wheat, oats, and others) lack both petals and sepals

C. Perfect flower — Flower that has both stamens and pistil

(NOTE: On this basis, the flowers of small grains are classified as *incomplete* because they lack both sepals and petals, but they are also classified as *perfect* because they contain both stamens and pistil.)

D. Imperfect flower — Flower that lacks either stamens or pistil

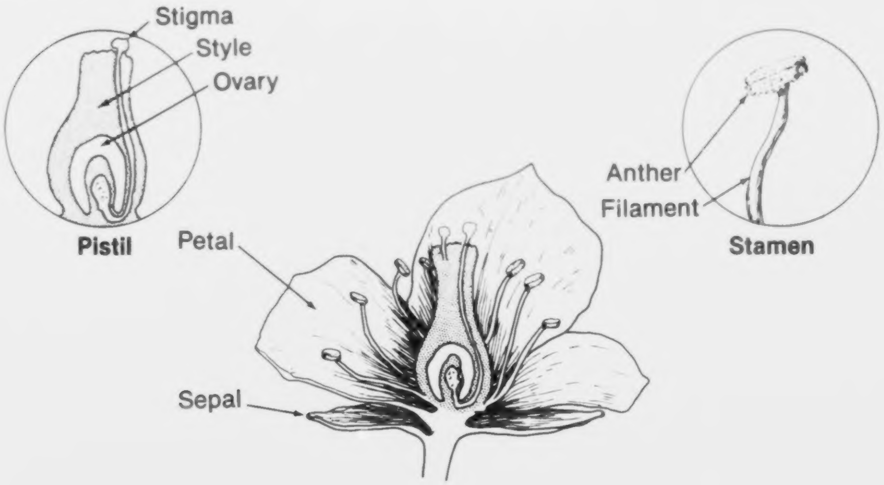
INFORMATION SHEET

(NOTE: The corn plant has two different flowers on the same plant. The tassel is a flower that contains the male organ or stamens, and the ear is the flower that contains the female organ or pistil. Each of these flowers is present on the corn plant but they are both imperfect flowers. Plants like the corn plant that contain pistil and stamen but in separate flowers on the same plant are called *monoecious*. When flowers containing only stamens and those containing only pistils are produced on entirely different plants, these plants are said to be *dioecious*.)

XIII. The parts of a flower (Figure 11)

(NOTE: Learning the parts of a complete flower will help you understand plant reproduction.)

FIGURE 11



XIV. Sexual reproduction (seed production) in plants

(NOTE: The seed-production process is extremely important because the seeds are the means by which most plants reproduce, and they are also important sources of food for man and livestock.)

A. Pollen grains are produced in anthers of stamens

B. Pollen grains are transferred from anther of stamen to stigma of pistil

(NOTE: This process is called *pollination*. Pollination may be accomplished by gravity, wind, insects, or man.)

C. Pollen grain produces a tube that grows downward through style into ovary

D. Pollen tube breaks open and sperm cells unite with egg cells

(NOTE: This process is called *fertilization*.)

E. The fertilized egg cells develop into mature seeds

INFORMATION SHEET

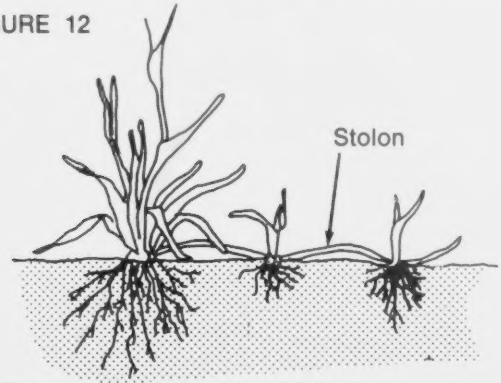
XV. Methods of asexual (vegetative) reproduction in plants (Figures 12 and 13)

(NOTE: The primary asexual reproductive method for plants is through modified horizontal stems. However, in horticultural work, there are other common asexual reproductive methods such as cuttings, budding, and grafting. These three methods are performed by humans, however, and are not a natural means of vegetative reproduction.)

A. Stolon — Method in which plant produces an aboveground, horizontal stem that can produce new shoots and roots at any node

EXAMPLES: Buffalo grass, strawberry, white clover

FIGURE 12

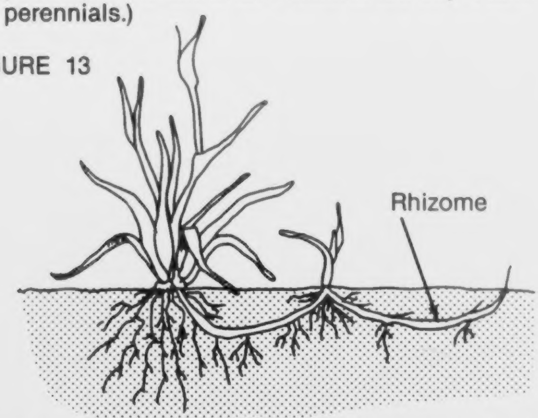


B. Rhizome — Method in which plant produces an underground, horizontal stem that can produce new shoots and roots at any node

EXAMPLES: Johnson grass, bermuda grass

(NOTE: Bermuda grass has both stolons and rhizomes. Shoots and roots may be formed at a node to form a new plant completely independent of the mother plant. The rhizomes and stolons are important winter food storage organs for perennials.)

FIGURE 13



Figures 12 and 13 used with permission of McGraw-Hill Book Company, Gregg Division, from *Working in Horticulture*, by William B. Richardson and Gary E. Moore, 1980.

INFORMATION SHEET

C. Tuber — Method in which plant produces modified rhizomes with enlarged terminal tips and nodes that produce buds

EXAMPLE: Potato

D. Bulb — Method in which plant produces short, thickened underground stem with fleshy, scalelike leaves that are filled with reserve food

EXAMPLES: Onions, tulips, lilies, and daffodils

XVI. Sequence of stages in the seed germination process (Figures 14 and 15)

(NOTE: After a seed is planted, germination is the key factor as to whether or not a plant ever gets started.)

A. Seed absorbs water and oxygen

B. Seed swells and seed coat ruptures

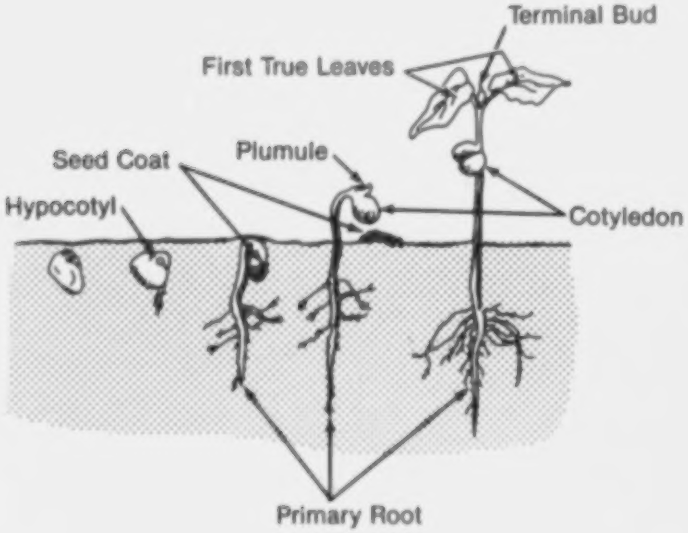
C. Primary (temporary) root emerges and grows downward

D. Plumule emerges and grows upward

E. Leaves form and food production starts

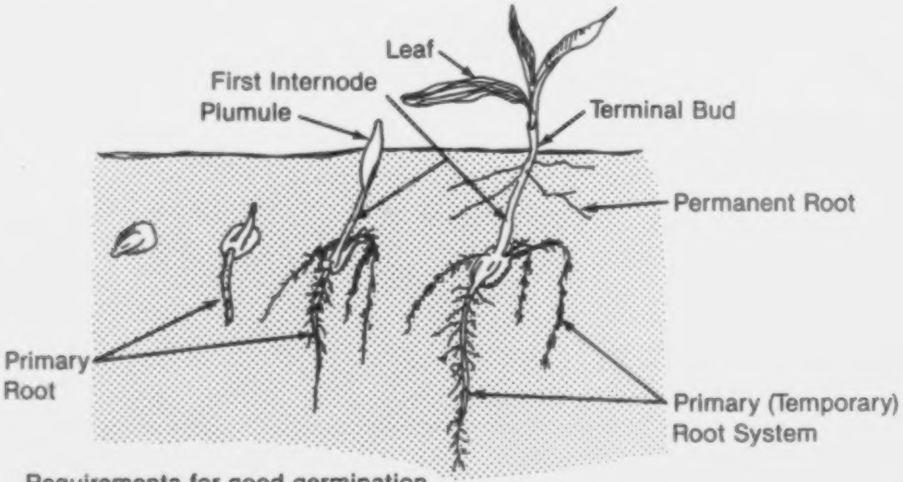
EXAMPLES:

FIGURE 14: Stages in the seed germination of a bean seed



INFORMATION SHEET

FIGURE 15: Stages in the seed germination of a corn seed


Leaf
First Internode
Plumule
Terminal Bud
Permanent Root
Primary Root
Primary (Temporary) Root System

XVII. Requirements for good germination

A. Healthy, undamaged, mature seed

B. Proper temperature

(NOTE: The temperature may range from 32° F to 120° F, but most seeds germinate in a range from 68° F to 86° F.)

C. Sufficient moisture

D. Ample supply of oxygen

XVIII. Factors that cause poor or no germination

A. Mechanical injury (cracked grain)

B. Disease

C. Poor storage conditions

D. Old age

E. Too cold a temperature

F. Hard seed coat (hard-seeded legumes)

G. Dried soil

H. Too deep a planting

I. Chemical change (fertilizer or herbicide)

J. Immature seed

INFORMATION SHEET

K. Inadequate supply of oxygen

XIX. Formula for and explanation of photosynthesis

A. Formula — $6CO_2 + 12H_2O + \text{Sunlight} \longrightarrow C_6H_{12}O_6 + 6H_2O + 6O_2$

B. Explanation

1. Light energy is taken in by chlorophyll-containing cells in leaves and converted to chemical energy
2. Carbon dioxide is taken from air by leaves
3. Water is taken in by roots and transported to leaves
4. Leaf cells manufacture food for plant through chemical reaction in which water and carbon dioxide combine in the presence of sunlight
5. Newly manufactured food is distributed throughout plant via phloem

EVALUATE PLANT GROWTH AND REPRODUCTION
UNIT III

ASSIGNMENT SHEET #1 — EVALUATE COMMON AGRICULTURAL PLANTS

NAME ______________________ SCORE __________

This assignment sheet provides you with the opportunity to apply much of the knowledge you studied in the information sheet. You will begin to understand how all of the information fits together to enable you to evaluate plant growth and reproduction.

Answer all of the questions in this assignment sheet based on the knowledge you have retained. Try not to refer to outside sources or to the information sheet.

There are twenty questions in this assignment sheet, each question counting five points for a perfect score of 100 points. When you have finished, swap your assignment sheet with a neighbor for grading.

A. **Wheat is one of the primary agricultural crops in the United States. It is classified as a grass. Hard, red winter wheat is planted in the fall and harvested in the spring. During the winter months, it is sometimes used for livestock grazing. The wheat flower has both stamens and pistil, but is missing petals and sepals.**

1. Since wheat is a grass, it would be classified by its cotyledons as a

   ____

2. Based on its life-cycle pattern, the wheat described above is also classified as a

   ____

3. Based on its normal agricultural use, wheat is classified as __________

4. If a farmer chose to use wheat as pasture for stocker cattle, this agricultural use would classify wheat as

   ____

5. What type of root does wheat have? __________

6. Describe a wheat leaf.

   ____

   ____

   ____

7. Is the flower of a wheat plant complete or incomplete? __________

8. What is the process called by which food is manufactured in the leaf of the wheat plant?

   ____

ASSIGNMENT SHEET #1

9. ____________________ carries food from the leaf to other parts of the wheat plant.

10. Do wheat plants reproduce sexually or asexually? ____________________

B. **Bermuda grass is an important forage and lawn grass in southern states.**

1. How is bermuda grass classified, based on life-cycle patterns? ____________________

2. How many cotyledons does bermuda grass produce? ____________________

3. Bermuda grass produces seed, but it is also a good example of ____________________ or ____________________ reproduction

4. Other than seed production, what two asexual methods of reproduction does bermuda grass use? ____________________

5. During long, dry summer months, bermuda grass stops or slows its growth and may begin to lose some of its color. What photosynthetic requirement is probably not being met and causing photosynthesis to slow down?

____

C. **Alfalfa and many clovers are important agricultural crops.**

1. Because these plants are harvested as hay, their agricultural-use classification would be ____________________

2. Since alfalfa is a legume, it has a ____________________ root, and its leaf is attached to the stem by a ____________________

3. Based on the number of its cotyledons, alfalfa is a ____________________

4. During drought seasons when some grasses seem to be suffering, why does mature alfalfa sometimes seem less starved for water? ____________________

____

5. Because male and female flowers are born on separate plants, alfalfa and some clovers depend on ____________________ for ____________________ pollination.

EVALUATE PLANT GROWTH AND REPRODUCTION
UNIT III

ANSWERS TO ASSIGNMENT SHEET

Assignment Sheet #1

A.
1. Monocot or monocotyledon
2. Winter annual
3. Grain crop
4. Forage or pasture crop
5. Fibrous
6. Long, slender, pointed leaf attached to the stem by means of a sheath
7. Complete
8. Photosynthesis
9. Phloem
10. Sexually

B.
1. Perennial
2. One
3. Asexual, vegetative
4. Rhizomes, stolons
5. Water

C.
1. Forage or pasture crop
2. Tap, petiole
3. Dicot or dicotyledon
4. Its taproot is able to reach soil moisture at greater depths than fibrous-root systems
5. Insects, cross-

EVALUATE PLANT GROWTH AND REPRODUCTION
UNIT III

JOB SHEET #1 — GERMINATE SEEDS

I. Equipment and materials

- A. Two, thin, lightweight cloths about the size of a washcloth

  (NOTE: Actually, old, thin washcloths work well because of the absorbency of the terry cloth.)

- B. Six mature, viable corn seeds
- C. Six mature, viable bean seeds
- D. Water
- E. Notebook and pencil

II. Procedure

- A. Place the two cloths flat on a table
- B. Place one set of seeds to a cloth, spacing them evenly across the center of the cloth and ensuring that no seed is closer to the edge than 1 inch
- C. Fold each cloth in half, covering the seeds
- D. Continue folding the cloths in half until they are folded to approximately 1-inch rolls
- E. Sprinkle water on rolled cloths until they are thoroughly damp but not saturated to the point of dripping
- F. Place dampened cloths in a warm area of the room that is well lighted but not in direct sunlight
- G. Check cloths daily and redampen if needed
- H. After two days, carefully unroll each cloth to observe the condition of the seeds, and then refold and redampen if necessary
- I. Continue checking the seeds daily and note any changes taking place

  (NOTE: Once the seeds are well into the germination process, evaluate the differences you see in the bean and corn seeds. Be sure to note the differences in the primary root and the cotyledon production.)

EVALUATE PLANT GROWTH AND REPRODUCTION
UNIT III

TEST

NAME ____ SCORE ________________

1. Match to their correct definitions terms associated with plant growth and reproduction. Write the correct numbers in the blanks.

______a. Plant producing one cotyledon

______b. Process in which a seed changes into a developing seedling

______c. Plant producing two cotyledons

______d. Transfer of pollen from anther of one plant to stigma of another plant

______e. Transfer of pollen from anther to stigma of same flower or to any other flower of same plant

______f. Nitrogen-fixing dicot in pea family with dry pods splitting along two sutures

______g. Union of sperm cells with egg cell, a plant breeding process necessary for the development of the embryo in most plants

______h. Transfer of pollen from anther to stigma; one step in plant breeding process

______i. Process by which in the presence of sunlight green living plants convert carbon dioxide and water to carbohydrates

______j. Leaf at first node of primary stem

______k. Pigment that gives plants their green color and is necessary for photosynthesis

1. Cotyledon (seed leaf)
2. Dicotyledon (dicot)
3. Monocotyledon (monocot)
4. Chlorophyll
5. Legume
6. Germination
7. Photosynthesis
8. Pollination
9. Fertilization
10. Cross-pollination
11. Self-pollination

2. Arrange in order the following stages in the life cycle of plants. Write a "1" before the first stage, a "2" before the second stage, and so on.

______a. Production of seed

______b. Germination

______c. Reproduction

______d. Emergence of seedling

______e. Maturity

______f. Planting of seed

______g. Vegetative growth

______h. Death or harvesting

TEST

3. Match to their correct descriptions plant classifications based on life-cycle patterns. Write the correct numbers in the blanks.

______a. Germinates in fall, overwinters, matures, sets seed, and dies in spring or early summer

______b. Survives more than two years (frequently indefinitely), usually producing seeds each year and then becoming dormant before starting new vegetative growth and repeating cycle

______c. Germinates, grows, reproduces, matures, and dies within one year

______d. Requires two years or two growing seasons to complete its life cycle

1. Annual
2. Winter annual
3. Biennial
4. Perennial

4. Discuss plant classifications based on agricultural use.

a. Cereal or grain crops — ______________________________

____

b. Oil-seed crops — ______________________________

____

c. Forage and pasture crops — ______________________________

____

d. Root and tuber crops — ______________________________

____

e. Fiber crops — ______________________________

____

f. Sugar crops — ______________________________

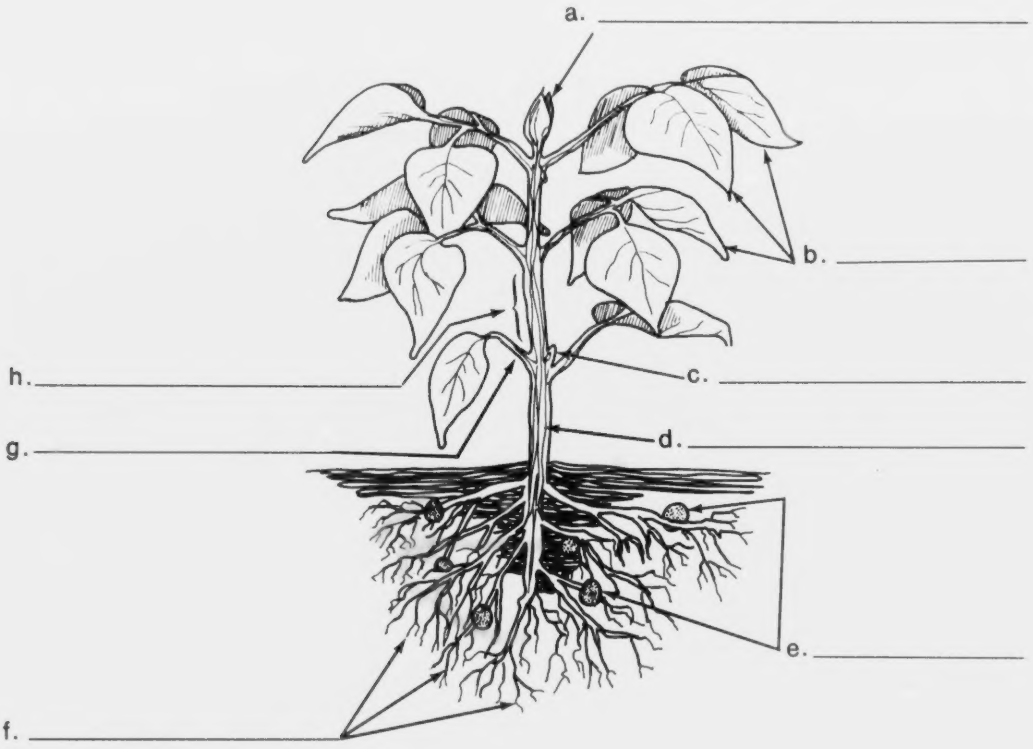
____

g. Special crops — ______________________________

____

TEST

5. Label the parts of the legume illustrated below.



6. Match the four basic plant parts to their correct functions. Write the correct numbers in the blanks.

_____a. Supports branches, leaves, flowers, seeds, and fruit; aids in food manufacturing process; stores food

_____b. Manufactures food for plant; absorbs carbon dioxide from air; intercepts sunlight; carries water and minerals from roots; carries manufactured food to other parts of plant; stores food

_____c. Anchors and supports plant; absorbs water and minerals; serves as overwintering structure for perennials; stores food

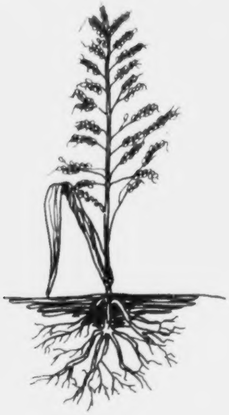
_____d. Serves as site for reproduction; stores food

1. Root
2. Stem
3. Leaf
4. Bud or flower

TEST

7. Name and describe each of the root types illustrated below.

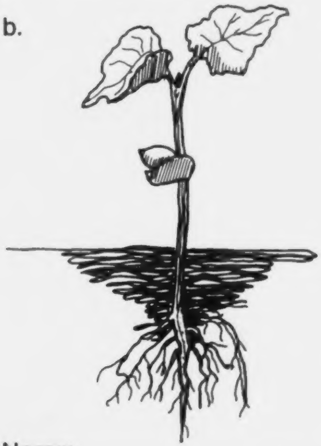
a.



Name: ____

Descripton: ____

b.



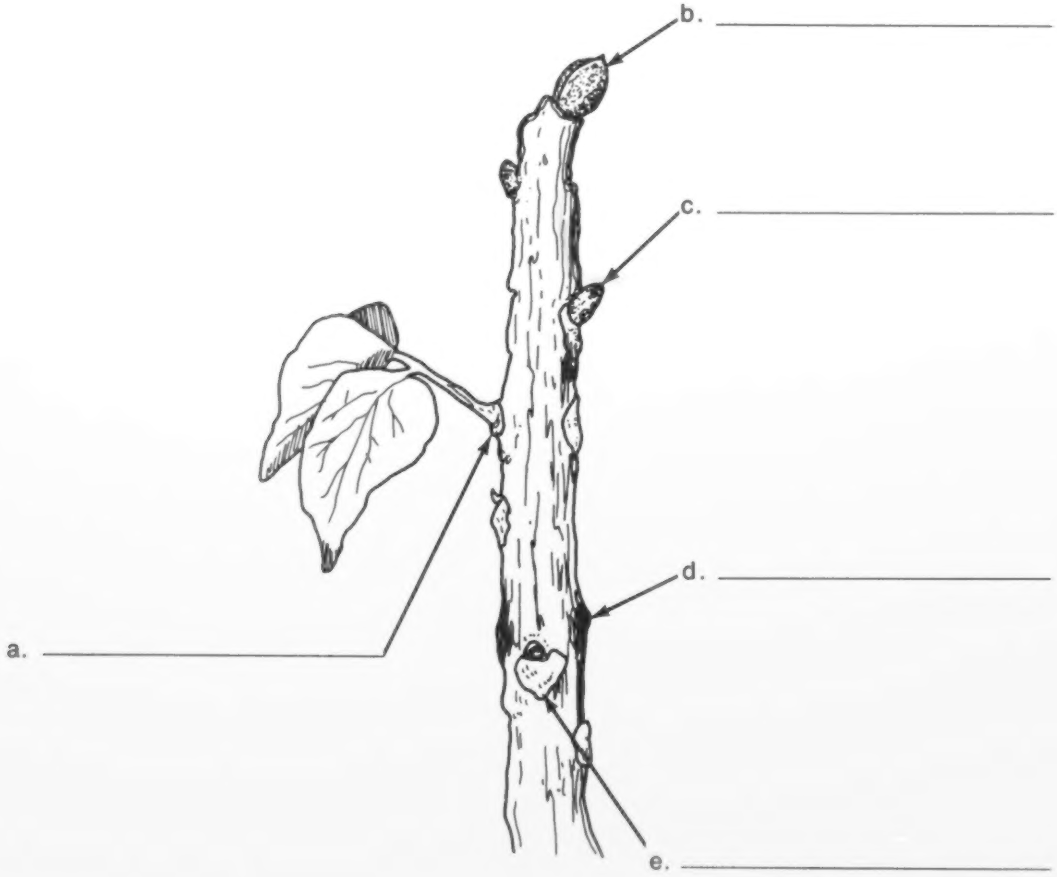
Name: ____

Description: ____

TEST

8. Identify the parts of the stem illustrated below. Write the correct names in the blanks.

Terminal bud
Abcission layer
Internode
Auxiliary bud
Node



9. Describe monocot and dicot leaf types.

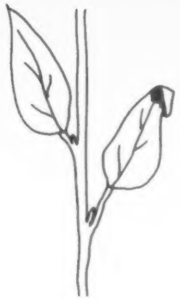
a. Monocot leaf —

b. Dicot leaf —

TEST

10. Name and describe the following dicot leaf-to-stem attachment patterns.

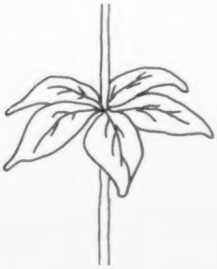
a.



Name: ______________________________

Description: ______________________________

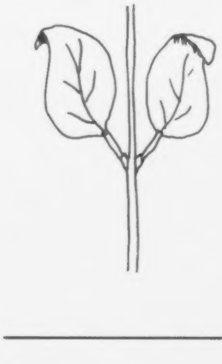
b.



Name: ______________________________

Description: ______________________________

c.



Name: ______________________________

Description: ______________________________

TEST

11. Distinguish between the vascular functions of phloem and xylem. Write an "X" in the blank before the function of phloem.

_____a. Moves water and mineral elements from roots to all parts of plant

_____b. Moves food manufactured in the leaves to all other parts of plant, including roots

12. Match to their correct definitions terms associated with flowers. Write the correct numbers in the blanks.

_____a. Flower that has both stamens and pistil

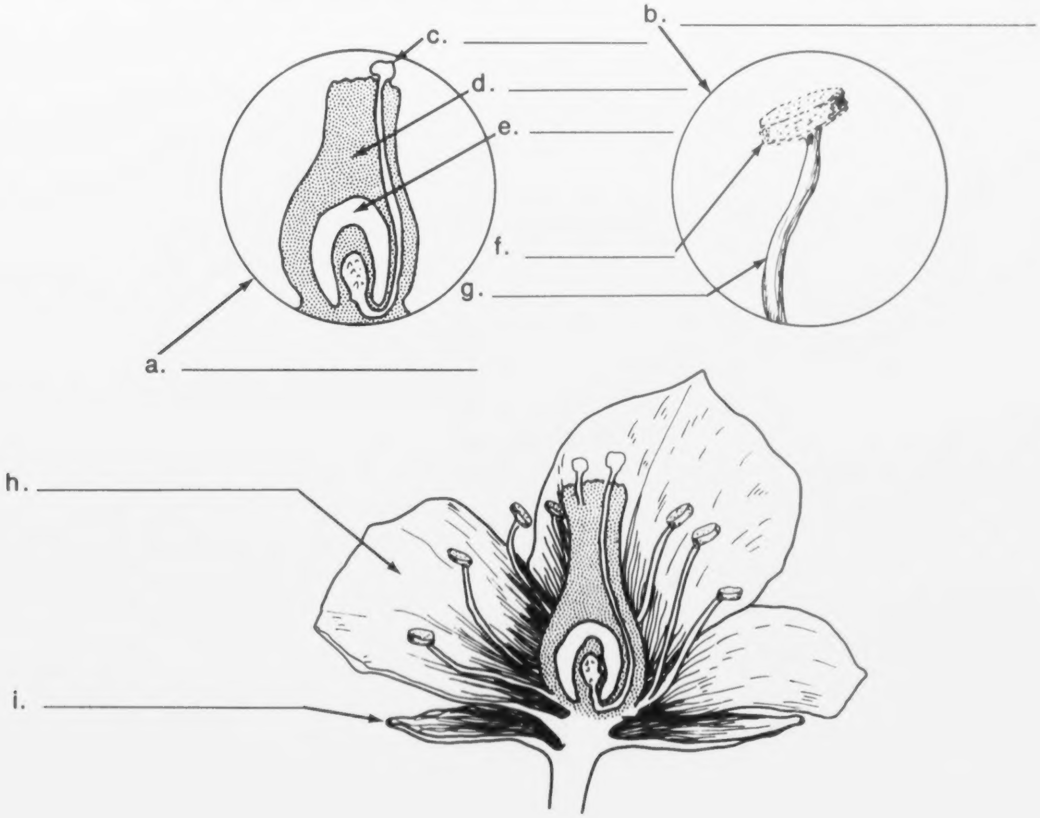
_____b. Flower that lacks either stamens or pistil

_____c. Flower having all four principal parts: sepals, petals, stamens, and pistil

_____d. Flower with one or more of its four principal parts missing

1. Perfect flower
2. Imperfect flower
3. Incomplete flower
4. Complete flower

13. Label the parts of the flower illustrated below.



TEST

14. Arrange in order the steps in plant sexual reproduction (seed production). Write a "1" before the first step, a "2" before the second step, and so on.

______a. Pollen grain produces a tube that grows downward through style into ovary

______b. Pollen grains are produced in anthers of stamens

______c. Pollen tube breaks open and sperm cells unite with egg cells

______d. Pollen grains are transferred from anther of stamen to stigma of pistil

______e. The fertilized egg cells develop into mature seeds

15. Match to their correct descriptions plant asexual (vegetative) reproduction methods. Write the correct numbers in the blanks.

______a. Method in which plant produces modified rhizomes with enlarged terminal tips and nodes that produce buds

______b. Method in which plant produces an aboveground, horizontal stem that can produce new shoots and roots at any node

______c. Method in which plant produces short, thickened underground stem with fleshy, scalelike leaves that are filled with reserve food

______d. Method in which plant produces an underground, horizontal stem that can produce new shoots and roots at any node

1. Stolon
2. Rhizome
3. Tuber
4. Bulb

16. Arrange in order the stages of the seed germination process. Write a "1" before the first step, a "2" before the second step, and so on.

______a. Seed swells and seed coat ruptures

______b. Plumule emerges and grows upward

______c. Seed absorbs water and oxygen

______d. Primary (temporary) root emerges and grows downward

______e. Leaves form and food production starts

17. Select from the following list requirements for good germination. Write an "X" in the blank before each correct answer.

______a. Proper time of day

______b. Ample supply of carbon dioxide

______c. Proper temperature

______d. Healthy, undamaged, mature seed

______e. Sufficient sunlight

______f. Ample suply of oxygen

______g. Sufficient moisture

TEST

18. List eight factors that cause poor or no germination.

    a. ____________________
    b. ____________________
    c. ____________________
    d. ____________________
    e. ____________________
    f. ____________________
    g. ____________________
    h. ____________________

19. State and explain the formula for photosynthesis.

    a. Formula: ____________________
    b. Explanation: ____________________

(NOTE: Test items 20 and 21 list the assignment and job sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

20. Evaluate common agricultural plants.

21. Demonstrate the ability to germinate seeds.

EVALUATE PLANT GROWTH AND REPRODUCTION
UNIT III

ANSWERS TO TEST

1. a. 3
   b. 6
   c. 2
   d. 10
   e. 11
   f. 5
   g. 9
   h. 8
   i. 7
   j. 1
   k. 4

2. a. 6
   b. 2
   c. 5
   d. 3
   e. 7
   f. 1
   g. 4
   h. 8

3. a. 2
   b. 4
   c. 1
   d. 3

4. Discussion should include the following

   a. Plants grown for their seed or grain to be used for food or cereal
   b. Plants grown for the vegetable oil and concentrated protein contained in the seed
   c. Plants grown for their leaf or plant parts and used as livestock feed
   d. Plants grown for their underground storage organs
   e. Plants grown for the materials they provide for clothing and shelter
   f. Plants grown for their sugar production
   g. Plants grown for a specific purpose; usually produced in smaller amounts than other crops

5. a. Bud
   b. Leaves
   c. Node
   d. Stem
   e. Nodules
   f. Roots
   g. Petiole
   h. Internode

6. a. 2
   b. 3
   c. 1
   d. 4

ANSWERS TO TEST

7. Answer should include the following

    a. Fibrous root
    Very branched and finely divided; varying in depth from a few inches to 5 or 6 feet, depending on soil conditions; very effective in holding plant in place and preventing erosion on steep slopes; found in grasses and in many nongrass species

    b. Taproot
    Penetrates to greater depth than other root type; has one central large root with small side-branching roots; central root creates advantage for plant to reach deeper soil moisture during dry periods; found in alfalfa, clovers, and carrots

8. a. Abcission layer
    b. Terminal bud
    c. Auxiliary bud
    d. Node
    e. Internode

9. a. Composed of blade and sheath; blade usually long, narrow, thin, and pointed; sheath attaches blade to main stem
    b. Composed of blade and petiole; blade usually composed of two or more leaflets; petiole attaches blade to main stem

10. Answer should include the following

    a. Alternate
    One leaf at each node

    b. Whorled
    Three or more leaves at each node

    c. Opposite
    Two leaves at each node, which are opposite each other

11. b

12. a. 1
    b. 2
    c. 4
    d. 3

13. a. Pistil
    b. Stamen
    c. Stigma
    d. Style
    e. Ovary
    f. Anther
    g. Filament
    h. Petal
    i. Sepal

ANSWERS TO TEST

14. a. 3
    b. 1
    c. 4
    d. 2
    e. 5

15. a. 3
    b. 1
    c. 4
    d. 2

16. a. 2
    b. 4
    c. 1
    d. 3
    e. 5

17. c, d, f, g

18. Answer should include any eight of the following

    a. Mechanical injury (cracked grain)
    b. Disease
    c. Poor storage conditions
    d. Old age
    e. Too cold a temperature
    f. Hard seed coat (harded-seed legumes)
    g. Dried soil
    h. Too deep a planting
    i. Chemical change (fertilizer or herbicide)
    j. Immature seed
    k. Inadequate supply of oxygen

19. Answer should include the following

    a. Formula: $6CO_2 + 12H_2O + \text{Sunlight} \longrightarrow C_6H_{12}O_6 + 6H_2O + 6O_2$

    b. Explanation: (1)Light energy is taken in by chlorophyll-containing cells in leaves and converted to chemical energy (2)Carbon dioxide is taken from air by leaves (3)Water is taken in by root and transported to leaves (4)Leaf cells manufacture food for plant through chemical reaction in which water and carbon dioxide combine in the presence of sunlight (5)Newly manufactured food is distributed throughout plant via phloem

20. Evaluated to the satisfaction of the instructor

21. Performance skills evaluated to the satisfaction of the instructor

SELECT SEED AND PREPARE SEEDBED
UNIT IV

UNIT OBJECTIVE

After completing this unit, the student should be able to evaluate seed based on appropriate selection criteria, identify common crop and selected noxious weed seeds, identify tillage systems and equipment, and determine appropriate tillage practices for given situations. The student will show this ability by completing the assignment sheets and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with seeds and seed selection.
2. Match to their correct descriptions commonly recognized classes of pedigreed seed.
3. Select from a list guidelines for selecting high-quality seed.
4. Discuss weed seed allowances in quality commercial seed samples.
5. Identify commercial seed tag requirements.
6. List critical considerations for storing seed.
7. Identify common crop seeds.
8. Identify seeds of selected noxious weeds.
9. Match to their correct definitions terms associated with seedbed preparation.
10. List the purposes of tillage.
11. Name and describe common systems of tillage and seedbed preparation.
12. Select from a list factors to consider in determining when to till.
13. Match common tillage equipment to their correct descriptions and illustrations.
14. Interpret seed tag analysis information.
15. Evaluate seed germination percentage.
16. Determine tillage operations and practices.

SELECT SEED AND PREPARE SEEDBED
UNIT IV

SUGGESTED ACTIVITIES

I. Unit contents

   A. Objective sheet

   B. Suggested activities

   C. Transparency Master #1 — Commercial Seed Tag

   D. Information sheet

   E. Assignment sheets

      1. Assignment Sheet #1 — Interpret Seed Tag Analysis Information

      2. Assignment Sheet #2 — Evaluate Seed Germination Percentage

      3. Assignment Sheet #3 — Determine Tillage Operations and Practices

   F. Answers to assignment sheets

   G. Test

   H. Answers to test

II. Instructor's guide

   A. Review unit and plan presentation. Plan how each section of the unit will be taught and make notes in your copy of the unit.

   B. Order or obtain materials needed to teach and supplement the unit.

      1. Publications

         a. *FFA Crops Contest Official Rules and Regulations* and *Crops Contest Kit*

            (NOTE: The contest kit contains plant and seed samples needed for training a crops judging team. Order from Dr. Kevin Donnelly, Department of Agronomy, Oklahoma State University, Stillwater, Oklahoma 74078; phone 405-624-7059.)

         b. OSU Fact Sheet No. 2040 "The What, Why, and How of Oklahoma Seed Certification"

         c. OSU Current Report No. CR-2077 "Summer Tillage and Seedbed Preparation for Wheat"

         d. OSU Current Report CR-2065 "Recent Advances in Reduced Tillage Systems for Wheat"

SUGGESTED ACTIVITIES

e. *Lo-Till Farming*

(NOTE: Publications *b* through *e* above may be obtained from your local OSU County Extension Office or from Central Mailing Service, Oklahoma State University, Stillwater, Oklahoma 74078.)

f. *Fundamentals of No-Till Farming*, published by American Association for Vocational Instructional Materials, Driftmier Engineering Center, Athens, Georgia 30602

(NOTE: Oklahoma teachers may order from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

2. Crop seed samples from local farmers or seed dealers

(NOTE: You may want to ask students to gather seed samples to be used in Assignment Sheet #1.)

3. Samples of the noxious weed seeds listed in Section VIII of the Information Sheet

4. Transparency and competency profiles

(NOTE: The transparency and competency profiles for this unit are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Make arrangements for special teaching needs.

1. Contact a local seed dealer or producer and make arrangements for this person to discuss with the class quality seed selection, storage, and production.

2. Set up a field trip to a crop farming operation to see lo-till or other tillage systems or seedbed preparation. Arrange for the farmer or producer to talk to the students about his or her tillage operation if a field trip cannot be arranged.

3. Plan a field trip to a farm equipment dealership to see tillage implements, or, if necessary, have the equipment dealer come to the class to talk about tillage implements.

(NOTE: If the equipment dealer comes to the class, have him or her bring brochures about various tillage implements. If this is not possible, you may want to obtain the brochures yourself to use in class.)

4. Arrange for a representative from the state certifying agency to speak to the class.

SUGGESTED ACTIVITIES

D. Provide students with unit.

E. Introduce unit.

SUGGESTIONS:

- Discuss unit and specific objectives. Point out the importance of seed selection and seedbed preparation, relating this information to the unit objective.
- Ask students to think about the total plant food production process and comment as to what they think is the *most* important part of it. Then list their comments on the chalkboard. After all comments are listed, review the list to see if the class can agree on one or two points. This exercise should bring out the importance of selection of quality seed and the necessity of getting the plant to germinate and start growing.
- Explain to students that selection of quality seed and germination are the most critical aspects of the total plant food production process. Seed selection is the determining factor as to whether the plant food gets produced. After this phase, other aspects become important, but this stage is the most critical.

F. Discuss information and assignment sheets.

1. Use Information Sheet, Section I to introduce students to terms associated with seeds and seed selection.
2. Use Information Sheet, Section II to discuss commonly recognized classes of pedigreed seeds and their descriptions.

   SUGGESTIONS:

   - Supplement your discussion with information from OSU Fact Sheet No. 2040.
   - Explain the significance of the different levels of certification.
   - Make it clear that this certifying system is really the only existing means of guaranteeing consistent quality and adoption of new and approved cultivars.
   - Invite a representative from the state certifying agency to speak to the class.
3. Use Information Sheet, Section III to discuss guidelines for selecting high-quality seed.

   SUGGESTIONS:

   - Use the local seed dealer as a resource person to speak to the class about selecting high-quality seed.

SUGGESTED ACTIVITIES

(NOTE: You may want to use the seed dealer as a resource person to supplement Sections IV through VII as well. If this is the case, spend some preparation time with the dealer, taking her or him a copy of the information sheet and explaining what you would like covered in the class presentation. Explain that you would like the resource person to give the students the opportunity to ask questions along the way.)

- If a seed dealer is not available to talk to the class, a good way to emphasize the importance of these guidelines is to allow the students to consider the results of not following the guidelines.

  EXAMPLE: Instead of purchasing from a reliable dealer, Farmer X buys the cheapest seed she can find, anywhere she can find it. What might be the results of this type of seed purchase?

4. Use Information Sheet, Sections IV and V to discuss weed seed allowances in quality commercial seed samples and to discuss commercial seed tag requirements.

   SUGGESTIONS:

   - Explain to students that weed seed allowances are obtained by using a probe to randomly sample seed. The sample obtained by the probe is then analyzed for weed seeds and inert matter.
   - Allow the local seed dealer to demonstrate the process of analyzing commercial seed for weed seed allowances.
   - Point out, or have the seed dealer point out in her or his class presentation, that the buyer is protected to some degree because the law sets specific limits on noxious weed seeds that may be included in crop seed for sale.
   - Use commercial seed tag analysis labels to point out the degree of weeds allowed in the samples.
   - Help students interpret commercial seed tag requirements. Use Transparency #1 to illustrate your discussion. The students can view their own copy in the information sheet or may look at the overhead projector screen. Be sure to explain how seed tag information ties in with weed allowances and the selection of high-quality seed.
   - Show students samples of the various colored tags for certified seed.
   - Have students complete Assignment Sheet #1. Critique and discuss in class.

5. Use Information Sheet, Section VI to discuss critical considerations for storing seed.

   SUGGESTIONS:

   - Stress the importance of humidity control, explaining that too much moisture raises the temperature level and kills the grain.

SUGGESTED ACTIVITIES

- Use two batches of viable seed in glass containers to demonstrate the effects of too high a humidity. Keep one batch at the correct humidity and the other at too high a humidity. Allow students to record temperatures and to observe the results of high humidity and high temperatures on the seeds.

- Have students complete Assignment Sheet #2. Critique and discuss in class.

6. Use Information Sheet, Sections VII and VIII to introduce students to the different common crop and noxious weed seeds illustrated.

SUGGESTIONS:

- Make a bulletin board display of real seeds or of pictures of each of the seed types.

- Set up a table to contain numbered samples of each of the seed types. Have the students identify the seeds by writing the correct names on a sheet of paper that has been numbered correspondingly.

- Refer to the *FFA Crops Contest Official Rules and Regulations* publication for a more extensive list of crop seeds and weed seeds, especially if you plan to train a crop judging team.

7. Introduce the idea of tillage and seedbed preparation by discussing Information Sheet, Sections IX through XII.

SUGGESTIONS:

- Tie tillage in with seed selection by pointing out that after quality seed selection, tillage is the next most critical step in the crop production process.

- Point out to students that familiarity with the terms in Section IX is essential to understanding the discussion of tillage and seedbed preparation.

- Discuss in more detail the note about when to till in Section XII. Give the students examples of producers who have made good and bad judgment calls.

- Arrange a field trip to a farming operation to observe tillage operations.

- Explain more fully each of the factors listed in Section XII. Give examples for each.

- Study Assignment Sheet #3 to determine how you would like the class to use it. It may be completed as a class project/discussion or as an individual assignment for each student to complete. Have students complete Assignment Sheet #3.

SUGGESTED ACTIVITIES

8. Use Information Sheet, Section XIII to discuss tillage equipment and its applications.

   SUGGESTIONS:

   - If a field trip is arranged to a farming operation to observe tillage operations, also plan on looking at and discussing the farmer's pieces of tillage equipment.
   - Arrange a field trip to a farm equipment dealership.
   - Use brochures on tillage equipment or look in current farm magazines for photographs for a bulletin board display.
   - Point out that there are many different names for the pieces of equipment shown in the information sheet, and that different individuals may refer to these implements by different names. Also point out that many other tillage implements exist and that those listed in the information sheet are only a small sample of the more common implements.
   - If you choose to go into more depth about tillage, point out the differences in tillage systems that dictate differences in planting equipment.

G. Review unit and assignment sheets as needed.

H. Give test.

I. Critique test and discuss in class.

J. Reteach and retest if necessary.

K. Complete appropriate section of competency profiles.

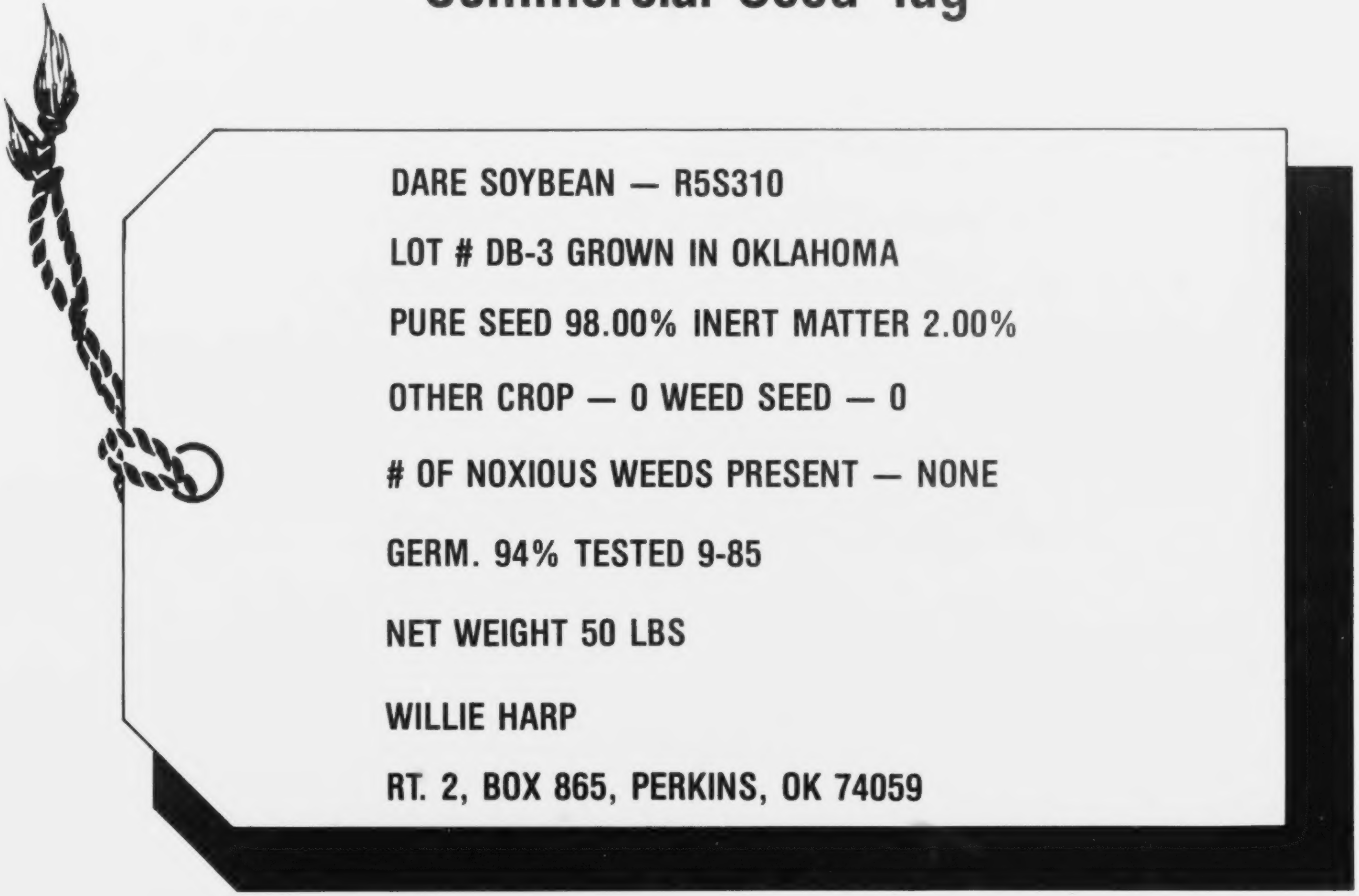
III. Unit references

A. Bishop, Douglas D., et. al. *Crop Science and Food Production.* New York: McGraw-Hill Book Company, 1983.

B. *Fundamentals of Machine Operation: Tillage.* Moline, Illinois: Deere & Company, 1976.

C. Metcalfe, Darrel S., and Donald M. Elkins. *Crop Production: Principles and Practices,* 4th ed. New York: Macmillian Publishing Company, Inc., 1980.

Commercial Seed Tag



DARE SOYBEAN — R5S310

LOT # DB-3 GROWN IN OKLAHOMA

PURE SEED 98.00% INERT MATTER 2.00%

OTHER CROP — 0 WEED SEED — 0

# OF NOXIOUS WEEDS PRESENT — NONE

GERM. 94% TESTED 9-85

NET WEIGHT 50 LBS

WILLIE HARP

RT. 2, BOX 865, PERKINS, OK 74059

SELECT SEED AND PREPARE SEEDBED
UNIT IV

INFORMATION SHEET

I. Terms and definitions associated with seeds and seed selection

  A. Cultivar (variety) — Identifable strain of a species that has specific characteristics of crop quality, adaptation, or resistance to pests

  (NOTE: The term *cultivar* is somewhat comparable to the term *breed* when speaking of animals.)

  B. Pedigreed seed — Genetically pure seed of known ancestry

  C. Germination — Complex series of events during which the reserve food in a seed is respired and the embryo grows, develops, and eventually becomes a self-sustaining plant

  D. Progeny — Children, descendents, offspring

  E. Scarification — Process of scratching seed coat of hard seed to make germination possible

  (NOTE: Some crop seeds have an extremely hard seed coat that sometimes prevents the initial opening of the seed to begin the germination process. Alfalfa is a common example of this type of seed. Scarification is a commerical, mechanical process that is usually performed on seeds before they are made available for sale.)

  F. Weed — Plant growing where it is not wanted

  G. Noxious weed — Unwanted plant that is particularly difficult to control or exterminate

  H. Dormancy — Resting stage through which ripe seeds usually pass and in which nearly all functions of life come to an almost complete standstill

  I. Viable seed — Seed that is living and is capable of germinating if given all of the necessary requirements to break seed dormancy

  (NOTE: Requirements necessary to break dormancy are moisture, oxygen, proper temperature, and in some cases light, scarification, and cold treatment.)

  J. Longevity — Length of life; amount of time a seed will remain viable or a plant will remain self-sustaining

II. Descriptions of commonly recognized classes of pedigreed seed

(NOTE: To ensure sources of high-quality seed, each state has established its own certifying agency. These agencies are usually called seed or crop improvement associations, and they are usually designated by state law as the official seed-certifying agency for that state. The associations closely monitor the production and distribution of seed, which must meet rigid inspection and handling requirements to assure consistency of the following classes.)

INFORMATION SHEET

A. Breeder's seed — Seed produced under direct supervision and control of plant breeder and not available for sale to the general public; comprises a limited amount of seed used to maintain a genetically pure source of a strain or cultivar

(NOTE: Breeder's seed is not one of the official pedigreed classes. After reproduction of a sufficient quantity, it becomes a foundation seed, which is the next level of certification.)

B. Foundation seed — Progeny of breeder seed that has been carefully produced to meet designated standards; upon meeting requirements, it is labeled with a white tag issued by the official certifying agency

(NOTE: Foundation seed is the source of all certified seed.)

C. Registered seed — Progeny of foundation seed that has been carefully produced and handled as designated by certifying agency to maintain satisfactory genetic identity and purity; upon meeting requirements, it is labeled with a purple tag issued by the official certifying agency

D. Certified seed — Progeny of foundation and registered seed that has been carefully produced to meet designated standards of genetic identity and purity; upon meeting requirements, it is labeled with a blue tag issued by the official certifying agency; most widely available class of seed

III. Guidelines for selecting high-quality seed

A. Purchase from a reliable dealer

B. Make sure that you are getting the cultivar (variety) that you want

C. Make sure that seed is free of weed seeds and of mixtures from other species and inert material

(NOTE: Guidelines for controlling foreign material in commercially sold seed are set by crop improvement associations and state laws.)

D. Know percentage of live seed that will develop

E. Check seed to be sure that it is free of damage caused by insects and disease pests

F. Check seed to be sure that it is free of mechanical damage

(NOTE: Seed is sometimes damaged during harvesting or processing. These processes can cause cracked, broken, or chipped seeds.)

G. Check to be sure that seeds are plump and full-sized

IV. Weed seed allowances in quality commercial seed samples

A. Prohibited noxious weeds — Not allowed to any degree in crop seeds for sale

B. Restricted noxious weeds — Limited to designated maximum number that may be found in 1 pound of crop seed sample

INFORMATION SHEET

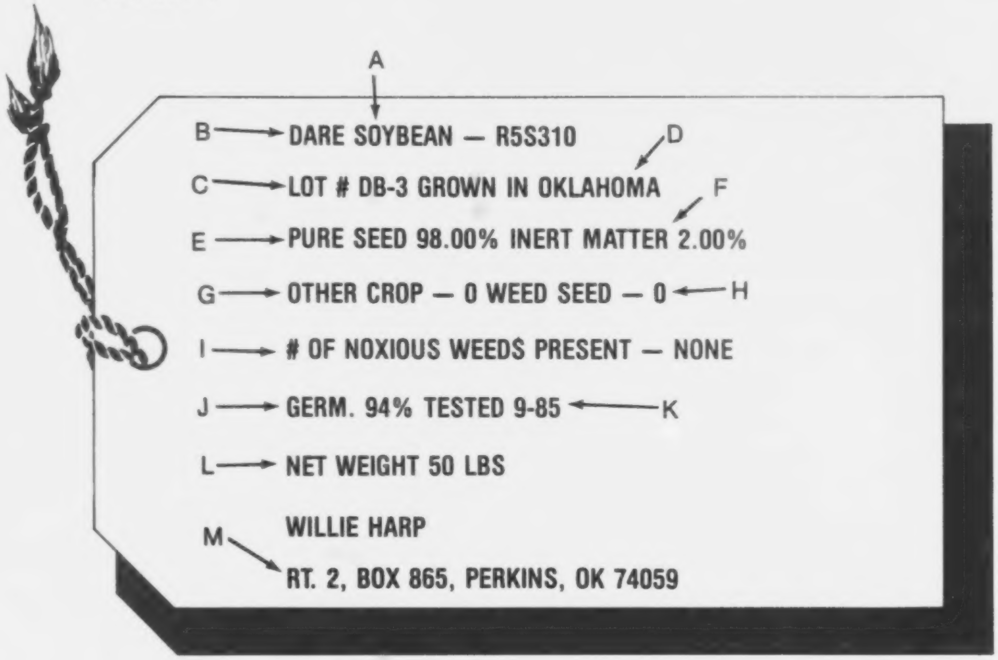
EXAMPLE: Johnson grass is limited to 100 seeds maximum per 1 pound crop seed

C. Other weed seed (common weeds) — Do not stop sale of seed but are not desirable

V. Commercial seed tag requirements (Figure 1)

(NOTE: The tag must be sewn to the bag of seed. If the sample is a pedigreed seed, the foundation, registered, or certified tag must also be attached to the bag.)

FIGURE 1



DARE SOYBEAN — R5S310
LOT # DB-3 GROWN IN OKLAHOMA
PURE SEED 98.00% INERT MATTER 2.00%
OTHER CROP — 0 WEED SEED — 0
# OF NOXIOUS WEEDS PRESENT — NONE
GERM. 94% TESTED 9-85
NET WEIGHT 50 LBS
WILLIE HARP
RT. 2, BOX 865, PERKINS, OK 74059

- A. Crop name
- B. Variety (cultivar)
- C. Grower's lot number
- D. Origin
- E. Pure seed percentage
- F. Inert matter percentage
- G. Other crop percentage
- H. Weed seed percentage
- I. Name and number of noxious weeds per pound
- J. Germination percentage
- K. Germination test date

  (NOTE: If the germination test date is nine months old, then the sample must be germination-tested again and retagged.)
- L. Weight of contents
- M. Name and address of shipper, seller, or person who labeled the seeds

INFORMATION SHEET

VI. Critical considerations for storing seeds

   A. Seed longevity

   (NOTE: Crops differ widely in seed longevity. For example the longevity of soybeans and peanuts is one to two years; of corn and rice, three to five years; and of wheat, five to ten years.)

   B. Storage conditions

   (NOTE: Temperature and humidity are the most important storage considerations, with humidity being more important than temperature. Optimum temperature for most seeds is 40°F and less than 50 percent moisture.)

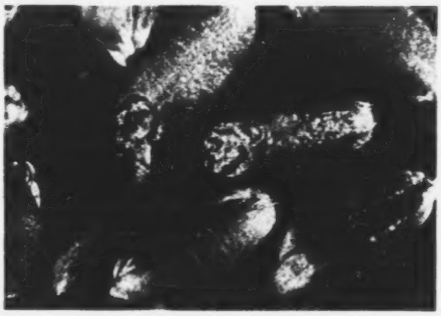
   C. Insects and pests

   (NOTE: Insects and pests destroy seed not only by eating it but also by raising the temperature.)

VII. Common crop seeds (Figures 2 - 14)

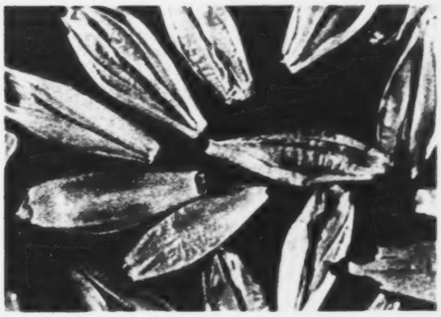
   A. Wheat

   FIGURE 2



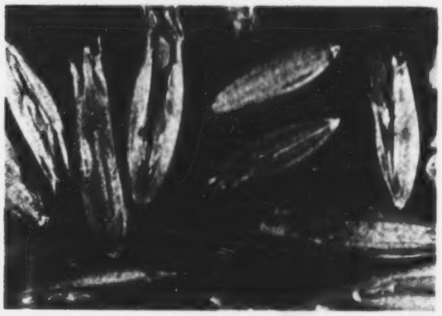
   B. Barley

   FIGURE 3



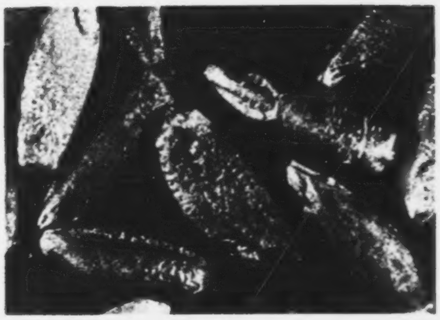
   C. Oats

   FIGURE 4



   D. Rye

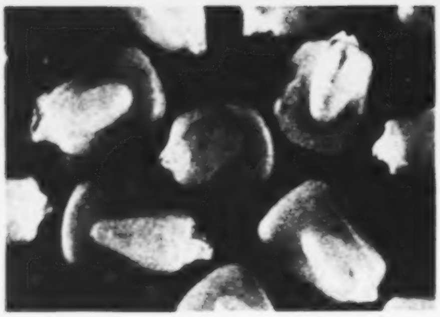
   FIGURE 5



INFORMATION SHEET

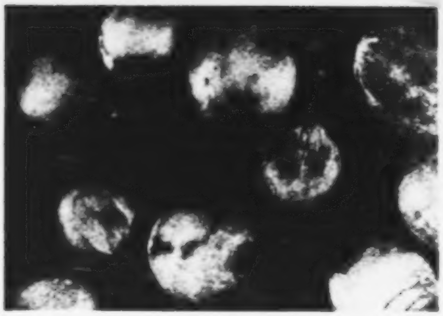
E. Corn

FIGURE 6



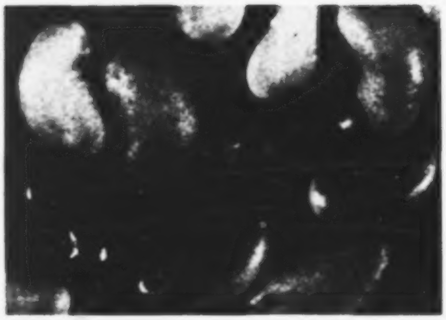
F. Sorghum

FIGURE 7



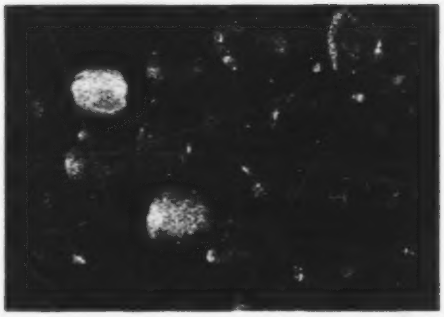
G. Alfalfa

FIGURE 8



H. Clover

FIGURE 9

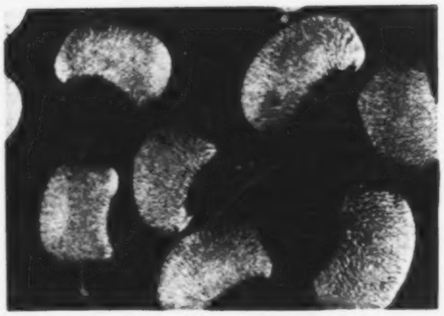


I. Lespedeza

FIGURE 10

J. Blackeye cowpea

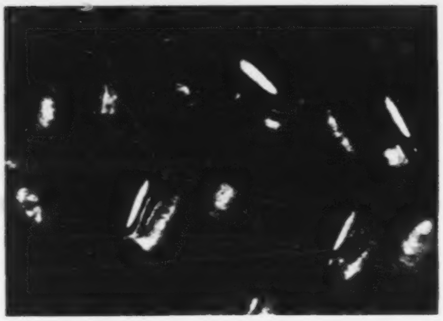
FIGURE 11



INFORMATION SHEET

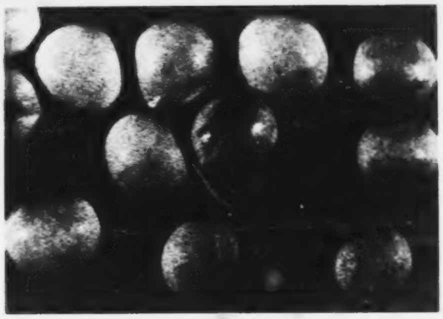
K. Mungbean

FIGURE 12



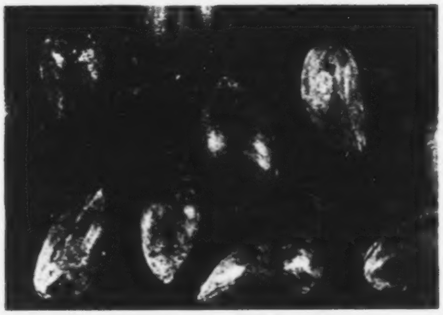
L. Soybean

FIGURE 13



M. Cotton

FIGURE 14

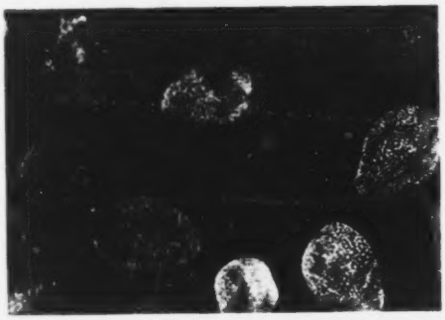


VIII. Seeds of noxious weeds (Figures 15 - 26)

A. Prohibited seeds (Figures 15 and 16)

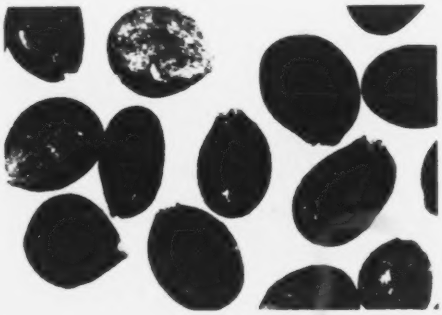
1. Field bindweed

FIGURE 15



2. Whitetop (hoary cress)

FIGURE 16

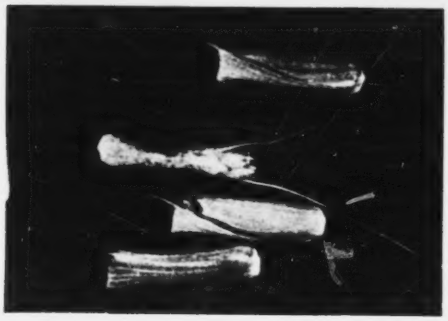


INFORMATION SHEET

B. Restricted seeds (Figures 17 - 26)

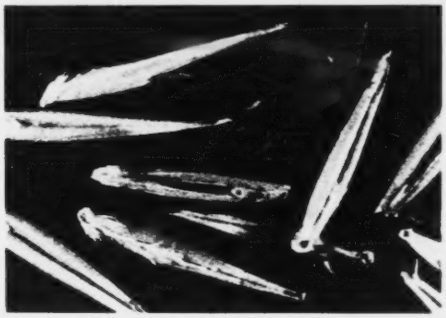
1. Jointed goat grass

FIGURE 17



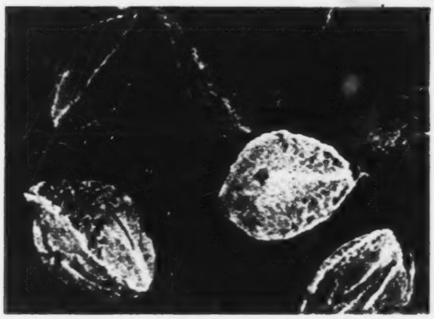
2. Wild oat

FIGURE 18



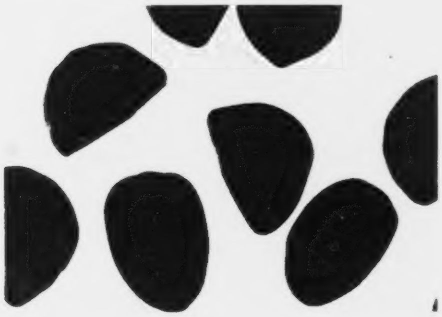
3. Wild buckwheat

FIGURE 19



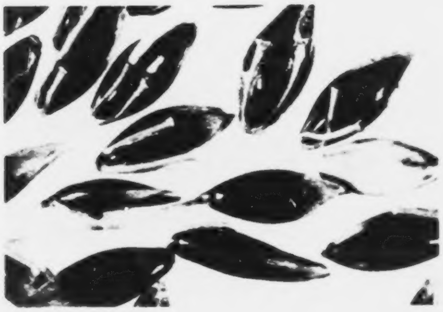
4. Common morning glory

FIGURE 20



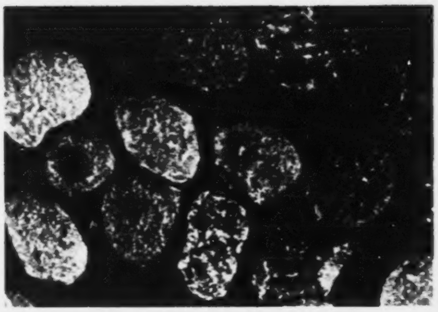
5. Johnson grass

FIGURE 21



6. Dodder

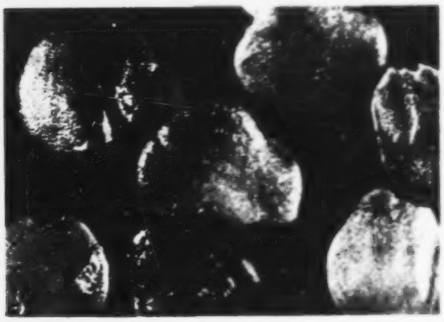
FIGURE 22



INFORMATION SHEET

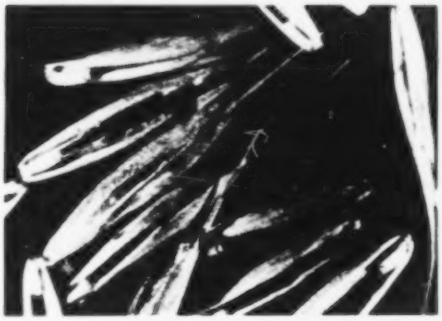
7. Silverleaf nightshade

FIGURE 23



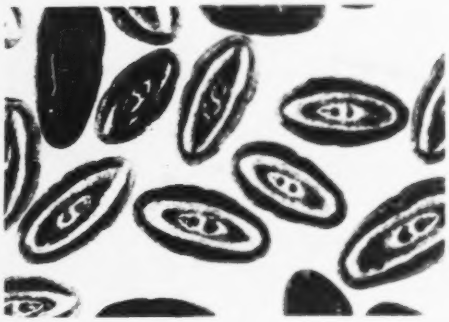
8. Cheat

FIGURE 24



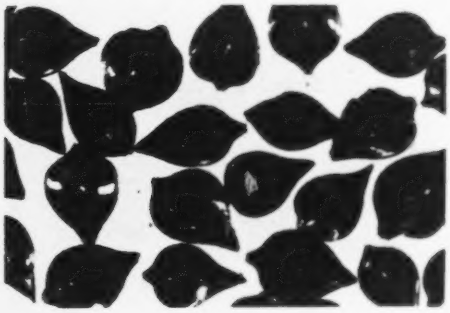
9. Bracted plantain

FIGURE 25



10. Curly dock

FIGURE 26



INFORMATION SHEET

IX. Seedbed preparation terms and definitions

A. Tillage — Operations performed on soil as improvement practices or as means of preparing or maintaining a seedbed or controlling weeds

B. Seedbed — Layer of soil prepared for planting seeds

C. Crop residue — Part of crop that is left on top of soil after harvesting

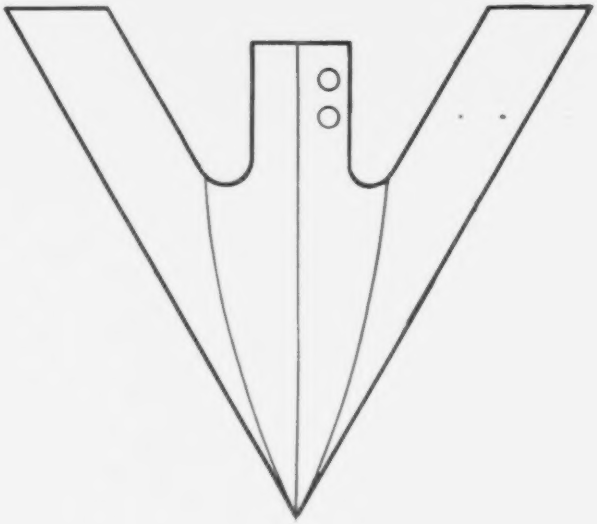
D. Fallow period — Growing season in which land is allowed to lie idle to build up soil moisture content for following crop the next growing season

(NOTE: Some types of tillage or chemical practices are usually done during the fallow period to control weeds and to improve moisture infiltration.)

E. Sweep — Attachment used on shanks of some tillage implements to loosen top 2 to 4 inches of soil and to destroy weeds (Figure 27)

EXAMPLE:

FIGURE 27



X. Purposes of tillage

A. Preparing seedbed for new crop

B. Destroying weeds

C. Managing crop residues

(NOTE: The management of crop residues usually involves at least partial incorporation.)

D. Aiding in control of insects and diseases

INFORMATION SHEET

E. Incorporating fertilizers into soil

F. Maintaining favorable soil surface conditions

G. Controlling erosion

H. Managing soil moisture

XI. Descriptions of common systems of tillage and seedbed preparation

A. Tillage

1. Clean-till — Cleaning surface of residue by incorporating previous crop residue into soil with moldboard plow soon after harvest; subsequent tillage is done for weed control and seedbed preparation

2. Stubble mulch — Using stubble-mulch plow or chisel plow soon after harvest to leave previous crop residue on soil surface throughout fallow period; subsequent tillage is done for weed control as needed

3. Lo-till — Using sweep or chisel plow with anhydrous ammonia attachment to incorporate nitrogen into soil; herbicides are primary means of subsequent weed control

B. No-tillage (no-till) — Planting crops in previously unprepared soil by opening a narrow slot, trench, or band only of sufficient width and depth to obtain proper seed coverage; subsequent soil preparation is not required and herbicides are used for weed control

XII. Factors to consider in determining when to till

(NOTE: No hard, fast rules exist on when tillage should be done. When to till is determined by the individual producer, based on a common-sense analysis of the factors listed below.)

A. Degree of weed control needed or desired

B. Potential erosion hazards that exist

C. Soil type and topography

D. Condition or amount of crop residue

E. Soil moisture level

XIII. Descriptions of common tillage equipment

(NOTE: Tillage implements are called different names in different parts of the country. The following descriptions use only one of the acceptable names for each implement.)

INFORMATION SHEET

A. Moldboard plow — A primary tillage implement that breaks loose or shears off a furrow slice, inverts the soil and breaks it into lumps, removes 95 to 100 percent of the surface residue, and normally plows 6 to 12 inches deep (Figure 28)

(NOTE: Moldboard plows are available in a variety of sizes, ranging from a single-bottom plow to a large gang plow that can turn up to ten 18-inch-wide furrows.)

FIGURE 28

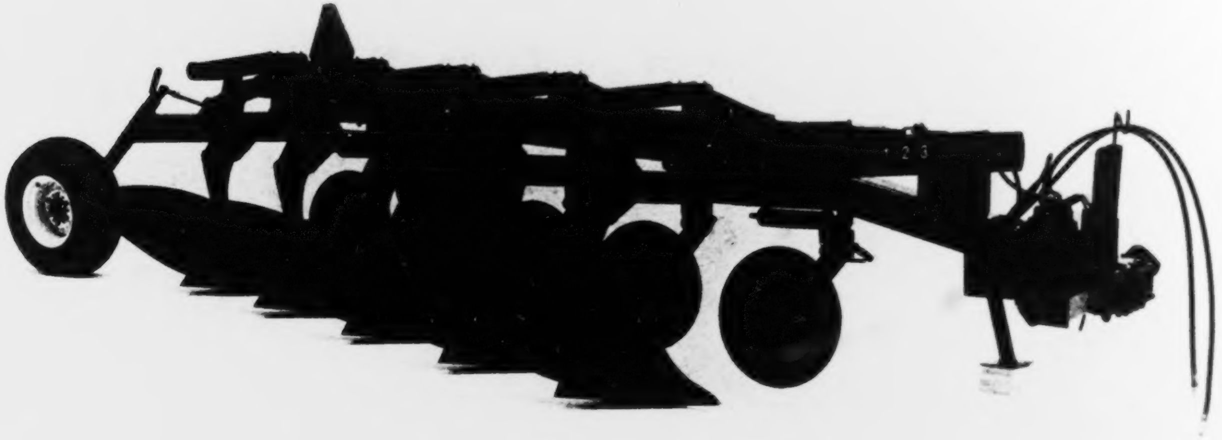


Figure 28 courtesy of Deere and Company.

INFORMATION SHEET

B. Chisel plow — A primary tillage implement that rips open the soil to a maximum depth of 15 inches, leaves about 75 percent of the crop residue, and consists of 2-inch-wide shank-attached spikes spaced approximately 12 inches apart (Figure 29)

(NOTE: The chisel plow may be also used with sweeps, rather than spikes, attached to the shanks.)

FIGURE 29

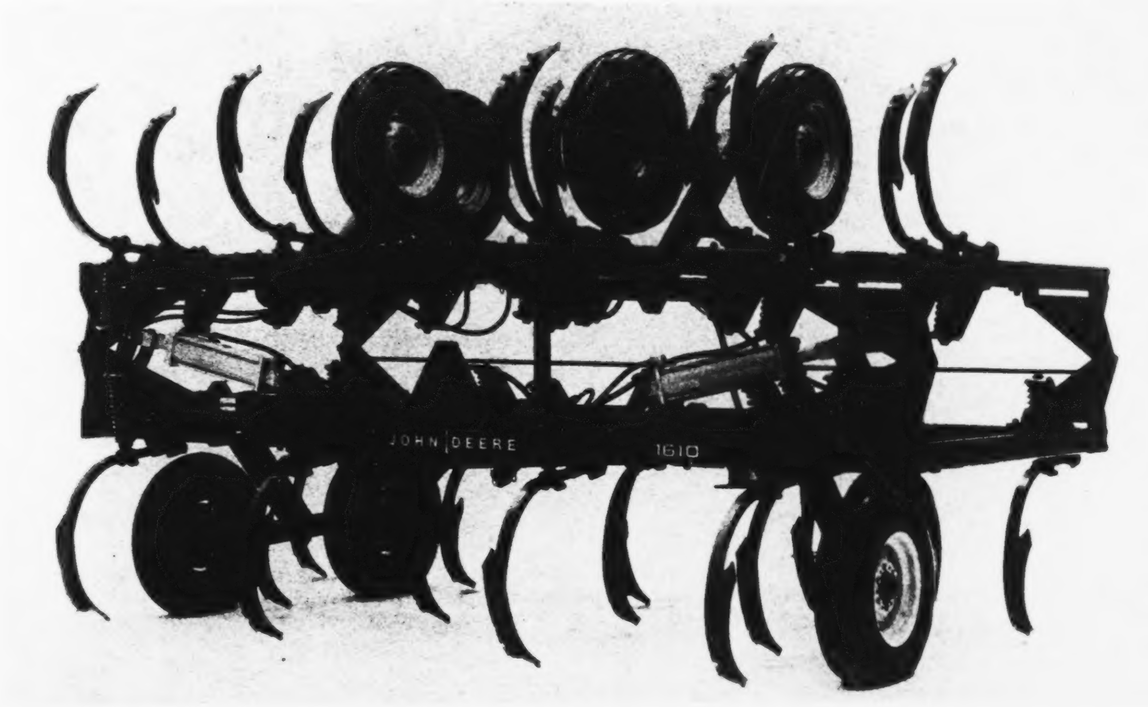


Figure 29 courtesy of Deere and Company.

C. Stubble-mulch plow — A primary or secondary tillage implement that cuts off weeds at roots approximately 3 to 4 inches deep, leaves 85 to 90 percent of crop residue, and consists of wide sweep plows with long V-shaped sweeps (Figure 30)

(NOTE: The plow may contain a single 5- to 5½-foot sweep or range to six or more 6- to 8-foot sweeps. The sweeps are usually staggered on the implement frame to permit smooth trash flow, and they are usually overlapped to ensure complete cutting of weed roots.)

FIGURE 30

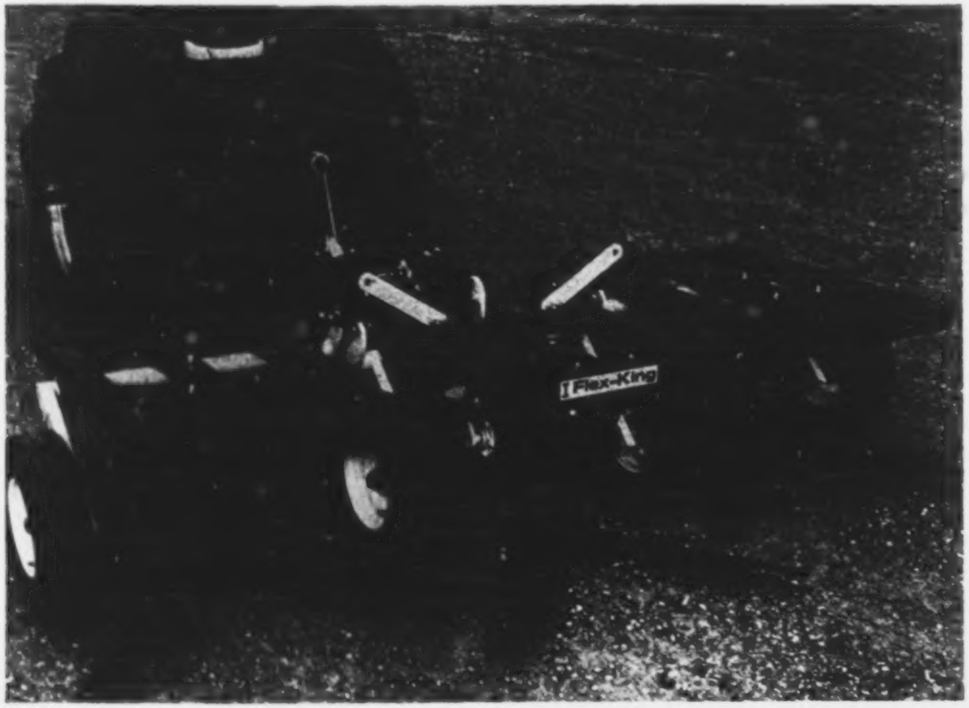


Figure 30 courtesy of Flex-King Corporation, Quinter, Kansas.

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INFORMATION SHEET

D. Offset disk — A primary or secondary tillage implement that leaves 50 to 60 percent of the crop residue, has a cutting depth of 3 to 8 inches, disk blades as large as 32 inches in diameter, and an overall width of as much as 36 feet (Figure 31)

FIGURE 31

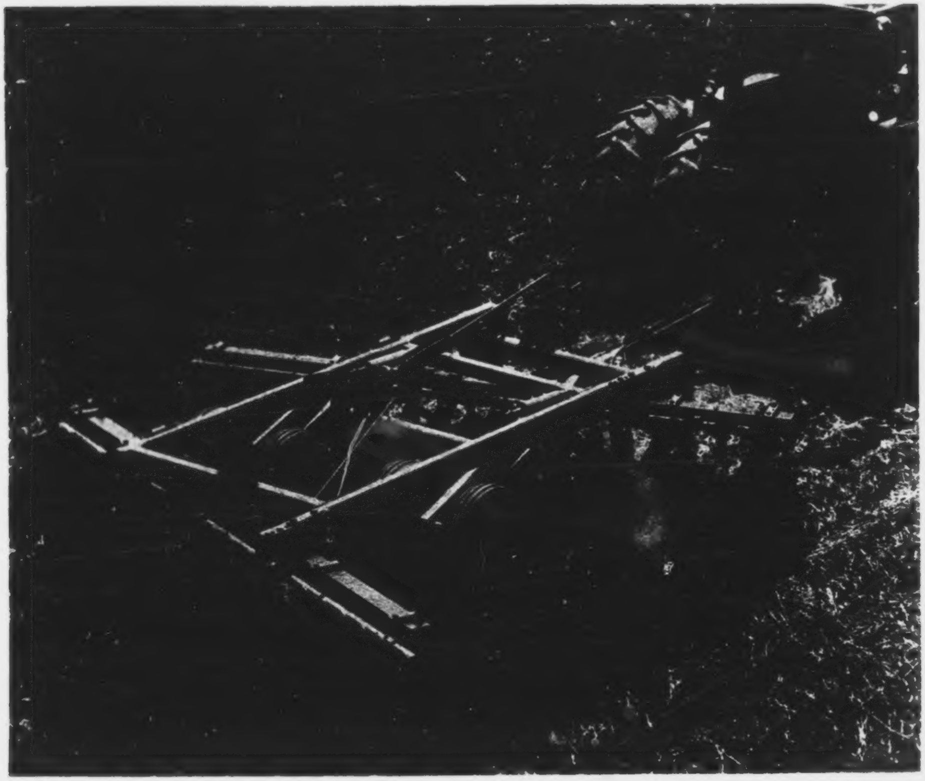


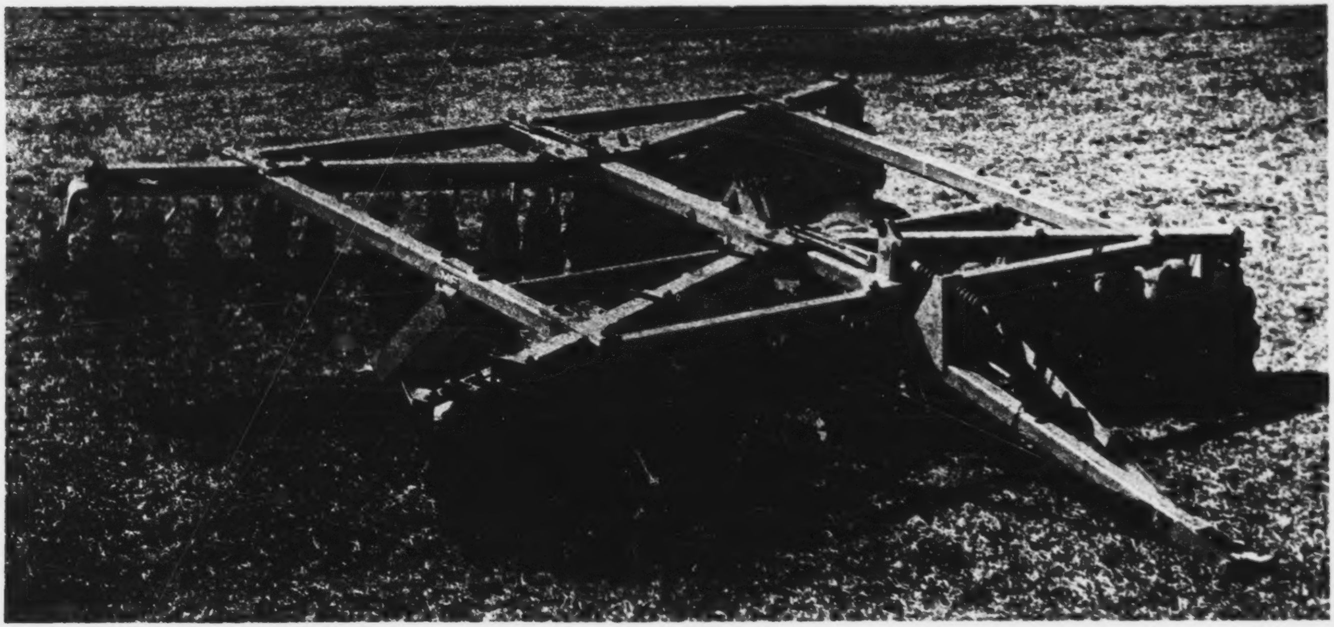
Figure 31 courtesy of Deere and Company.

INFORMATION SHEET

E. Tandem disk — A primary or secondary tillage implement different in design but very similar in function to an offset disk (Figure 32)

(NOTE: Lighter tandem disks are usually thought of as secondary tillage implements as they do a good job of breaking the soil in preparation for a seedbed.)

FIGURE 32



INFORMATION SHEET

F. Subsoiler — A primary tillage implement that breaks the plow pan, removes very little crop residue, and is excellent for breaking up deeper soil layers beyond ordinary tillage operations; penetrates 16 to 22 inches deep and is designed with extremely strong reinforced shanks 18 to 40 inches apart (Figure 33)

FIGURE 33

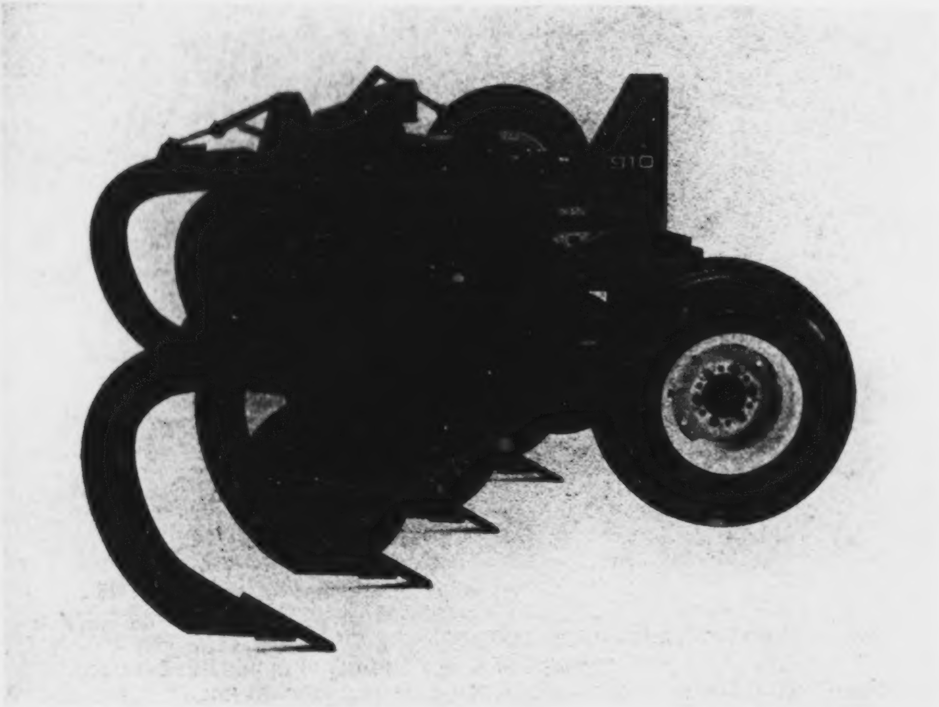


Figure 33 courtesy of Deere and Company.

G. Field cultivator (conditioner) — An implement used mostly for secondary tillage; similar in appearance to chisel plow, but lighter and designed for less severe operating conditions; leaves approximately 80 percent of the crop residue (Figure 34)

(NOTE: The field cultivator may be from 7½ feet to 60½ feet wide and contains staggered shank bars, usually spaced about 6 inches apart, to be used with a variety of points or sweeps.)

FIGURE 34

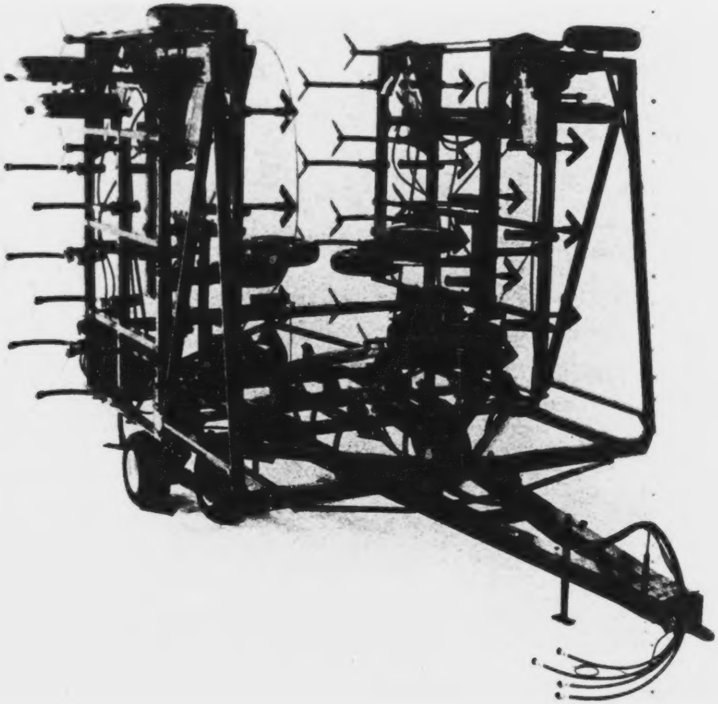


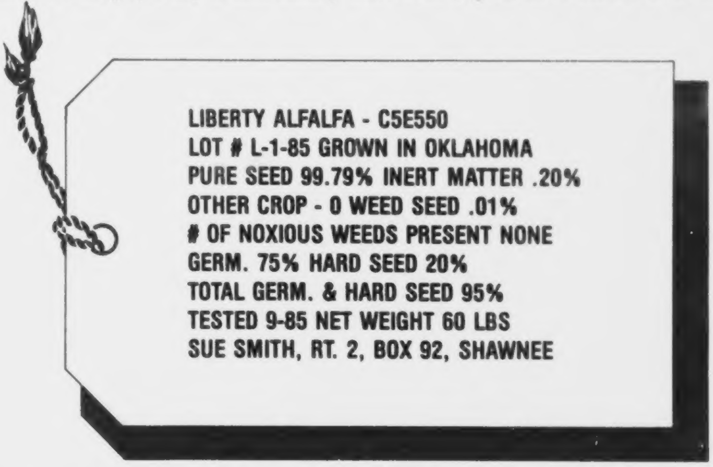
Figure 34 courtesy of Deere and Company.

SELECT SEED AND PREPARE SEEDBED
UNIT IV

ASSIGNMENT SHEET #1 — INTERPRET SEED TAG ANALYSIS INFORMATION

NAME ______________________________ SCORE ____________

In the information sheet of this unit, you have studied seed tag requirements and some factors related to selecting quality seed. Study the seed tag below and answer the questions that follow.



LIBERTY ALFALFA - C5E550
LOT # L-1-85 GROWN IN OKLAHOMA
PURE SEED 99.79% INERT MATTER .20%
OTHER CROP - 0 WEED SEED .01%
# OF NOXIOUS WEEDS PRESENT NONE
GERM. 75% HARD SEED 20%
TOTAL GERM. & HARD SEED 95%
TESTED 9-85 NET WEIGHT 60 LBS
SUE SMITH, RT. 2, BOX 92, SHAWNEE

A. What is the origin of this seed sample? ______________________________

B. What is the crop? ______________________________

C. What is the cultivar? ______________________________

D. This sample contains ______________________________% inert matter

E. The weed seed present in this sample is ______________________________%

F. This sample has no noxious weeds present, but the pounds of allowable prohibited noxious weeds would be ______________________________

G. The actual germination rate was ______________________________%

H. ____________% of the seed were found to be hard seed

I. The process of treating hard seed to help germination is called ______________

J. The date of the germination test on this seed was ______________________________

K. What must be done if the germination test was performed more than nine months ago?

____

SELECT SEED AND PREPARE SEEDBED
UNIT IV

ASSIGNMENT SHEET #2 — EVALUATE SEED GERMINATION PERCENTAGE

NAME ______________________________ SCORE ______________

As you have learned from studying the information sheet, germination rate is an extremely important factor when selecting quality seed. In the exercise below you will perform an actual germination test over a period of a few days. Read and follow the instructions and complete the evaluation.

A. Obtain a quantity of seed (at least 100 seeds) of a crop you may be interested in, preferably a cereal grain or legume crop such as corn, wheat, barley, oats, rye, grain sorghum, soybeans, peanuts, mungbean, or field peas.

B. Count out 100 seeds of your selected crop.

C. Place the seeds in a flat dish between several layers of paper towels or newspaper.

D. Keep the paper towels or newspaper moist and place the sample in a warm place (approximately 70°F).

E. Put waxed paper or plastic wrap around the container to help retain the moisture.

F. At the end of the germination period (normally 7 to 10 days) count the seeds that have germinated normally, with both a root and shoot.

G. Record below the percentage of seeds that have germinated.

1. Name of crop ______________________________
2. Variety (if known) ______________________________
3. Source of seed sample ______________________________
4. Date germination test was started ______________________________
5. Date germination percentage was calculated ______________________________
6. Germination percentage ______________________________%
7. Comments (if anything unusual was observed)

____

____

SELECT SEED AND PREPARE SEEDBED
UNIT IV

ASSIGNMENT SHEET #3 — DETERMINE TILLAGE OPERATIONS AND PRACTICES

NAME ______________________________ SCORE ____________

A number of options are being studied in production agriculture to increase efficiency of production and to reduce expenses. With increased equipment costs, high interest rates for borrowed money, and expensive fuel, the successful producer is studying all aspects of profitable crop production.

In this assignment sheet, you are asked to recall information you have studied as it relates to efficient crop production. You also have the opportunity to make decisions based on circumstances given. Read through the assignment sheet and answer the questions presented.

A. Wheat producer, Bill Wallace, has just harvested a good wheat crop. He plans to let the land lay idle over the summer and to plant wheat again in the fall. Bill has always used a clean-till system in the past, but is considering using a stubble-mulch system this year. He has heard that there are advantages to using stubble-mulch tillage and he has all of the types of equipment needed for the tillage operation. Another reason he is considering this type of tillage system is that in the past he has had some problem with wind erosion. Also, some years top soil moisture has been lacking at planting time in the fall.

1. The term for allowing land to lie idle over the summer is ____________________.

2. In Bill's previous system of clean-till, his first tillage operation always required using

   a ______________ ______________, the most common implement for

   ____________ tillage.

3. In the past, Bill used a tandem disk for his remaining two or three trips over the land during the summer to control weeds. The disking operation would be referred to as

   ____________ tillage.

4. In this year's stubble-mulch system, Bill is trying to decide which tillage implement to use immediately after harvest. He has a stubble-mulch plow, the tandem disk, and a field cultivator. Which implement would you suggest he use?

   ____

5. What would you suggest that Bill use later in the summer to control weeds, leave a large amount of residue, and still basically keep the soil worked to allow infiltration of moisture during rains?

   ____

6. What do you see as some of the advantages of this stubble-mulch tillage system?

   ____

   ____

ASSIGNMENT SHEET #3

B. Crop producer Sue Young has recently obtained some quality farm land to expand her operation. She has been growing primarily wheat. Because of the tillage methods used in the past, the soil has a compacted plow pan approximately 10 inches deep. After taking care of this problem, Sue intends to implement a low-tillage system. She is to take possession May 15, because the current wheat crop is being grazed out. She intends to first take care of the plow pan problem and to let the land lay fallow the first summer of possession. She will control the weeds with herbicides and plant wheat in the fall.

After her first wheat crop is harvested, Sue hopes to plant a crop of mungbeans for a summer crop, still maintaining a low-tillage type of operation.

1. What tillage implement should Sue use to take care of the plow pan problem?

   ____

2. What should be done with the summer fallow ground to maintain weed control and a low-till operation?

   ____

   ____

3. After her first wheat crop is harvested, what tillage operations will need to be done to get ready to plant the mungbean crop?

   ____

   ____

SELECT SEED AND PREPARE SEEDBED
UNIT IV

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

A. Oklahoma
B. Alfalfa
C. Liberty
D. .20
E. .01
F. Zero
G. 75
H. 20
I. Scarification
J. 9 - 85
K. It must be retested and retagged

Assignment Sheet #2 — Evaluated to the satisfaction of the instructor

Assignment Sheet #3

A. 1. Fallow
   2. Moldboard plow; primary
   3. Secondary
   4. Stubble-mulch plow
   5. Evaluated to the satisfaction of the instructor
   6. Evaluated to the satisfaction of the instructor

B. 1. Subsoiler
   2. Evaluated to the satisfaction of the instructor
   3. Evaluated to the satisfaction of the instructor

SELECT SEED AND PREPARE SEEDBED
UNIT IV

TEST

NAME ______________________________ SCORE ______________

1. Match to their correct definitions terms associated with seeds and seed selection. Write the correct numbers in the blanks.

______a. Identifiable strain of a species that has specific characteristics of crop quality, adaptation, or resistance to pests

______b. Children, descendents, offspring

______c. Length of life; amount of time a seed will remain viable or a plant will remain self-sustaining

______d. Plant growing where it is not wanted

______e. Genetically pure seed of known ancestry

______f. Unwanted plant that is particularly difficult to control or exterminate

______g. Seed that is living and is capable of germinating if given all of the necessary requirements to break seed dormancy

______h. Process of scratching seed coat of hard seed to make germination possible

______i. Complex series of events during which the reserve food in a seed is respired and the embryo grows, develops, and eventually becomes a self-sustaining plant

______j. Resting stage through which ripe seeds usually pass and in which nearly all functions of life come to an almost complete standstill

1. Longevity
2. Germination
3. Dormancy
4. Cultivar (variety)
5. Pedigreed seed
6. Weed
7. Noxious weed
8. Viable seed
9. Scarification
10. Progeny

2. Match to their correct descriptions commonly recognized classes of pedigreed seed. Write the correct numbers in the blanks. Descriptions continue on next page.

______a. Progeny of foundation seed that has been carefully produced and handled as designated by certifying agency to maintain satisfactory genetic identity and purity; upon meeting requirements, it is labeled with a purple tag issued by the official certifying agency

1. Breeder's seed
2. Foundation seed
3. Registered seed
4. Certified seed

TEST

_____b. Seed produced under direct supervision and control of plant breeder and not available for sale to the general public; comprises a limited amount of seed used to maintain a genetically pure source of a strain or cultivar

_____c. Progeny of foundation and registered seed that has been carefully produced to meet designated standards of genetic identity and purity; upon meeting requirements, it is labeled with a blue tag issued by the official certifying agency; most widely available class of seed

_____d. Progeny of breeder seed that has been carefully produced to meet designated standards; upon meeting requirements, it is labeled with a white tag issued by the official certifying agency

3. Select from the following list guidelines for selecting high-quality seed. Write an "X" in the blank before each correct answer.

_____a. Purchase from dealer with the best buys

_____b. Make sure that you are getting the cultivar (variety) that you want

_____c. Make sure that seed is full of weed seeds and of mixtures from other species and inert material

_____d. Know percentage of live seed that will develop

_____e. Check seed to be sure that it is free of damage caused by insects and disease pests

_____f. Check seed to be sure that it is cracked, broken, and chipped so that it will germinate

_____g. Check to be sure that seeds are plump and full-sized

4. Discuss weed seed allowances in quality commercial seed samples.

a. Prohibited noxious weeds — ______________________________

____

b. Restricted noxious weeds — ______________________________

____

c. Other weed seed (common weeds) — ______________________________

____

TEST

5. Identify commercial seed tag requirements illustrated on the tag below. Write the correct numbers in the blanks.

______a. Variety (cultivar)

______b. Germination percentage

______c. Weed seed percentage

______d. Pure seed percentage

______e. Origin

______f. Name and number of noxious weeds per pound

______g. Weight of contents

______h. Germination test date

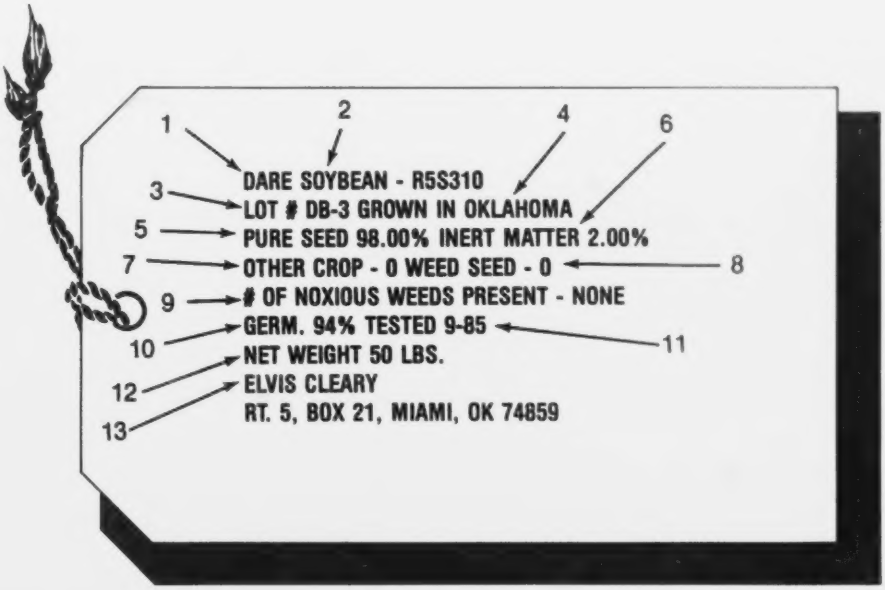
______i. Name and address of shipper, seller, or person who labeled seeds

______j. Grower's lot number

______k. Other crop percentage

______l. Inert matter percentage

______m. Crop name



DARE SOYBEAN - R5S310
LOT # DB-3 GROWN IN OKLAHOMA
PURE SEED 98.00% INERT MATTER 2.00%
OTHER CROP - 0 WEED SEED - 0
OF NOXIOUS WEEDS PRESENT - NONE
GERM. 94% TESTED 9-85
NET WEIGHT 50 LBS.
ELVIS CLEARY
RT. 5, BOX 21, MIAMI, OK 74859

6. List critical considerations for storing seed.

a. ______________________________

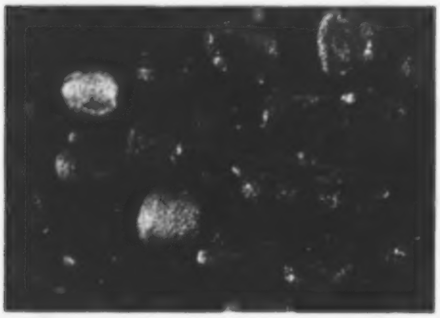
b. ______________________________

c. ______________________________

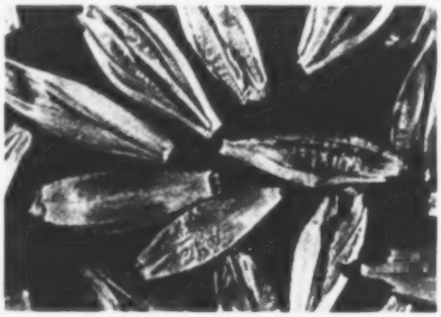
TEST

7. Identify the following common crop seeds. Write the correct names in the blanks below the illustrations.

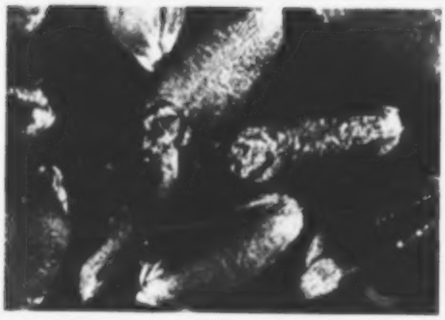
Wheat
Oats
Corn
Barley
Rye
Sorghum
Alfalfa
Lespedeza
Mungbean
Clover
Blackeye cowpea
Soybean
Cotton



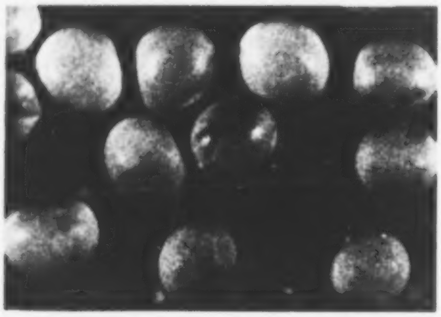
a. ______________________



b. ______________________

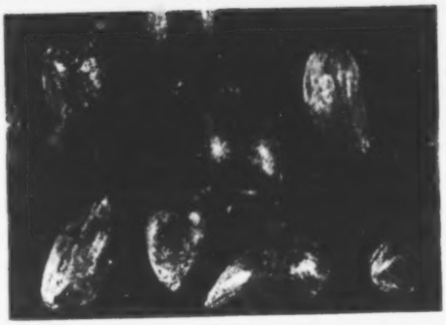


c. ______________________

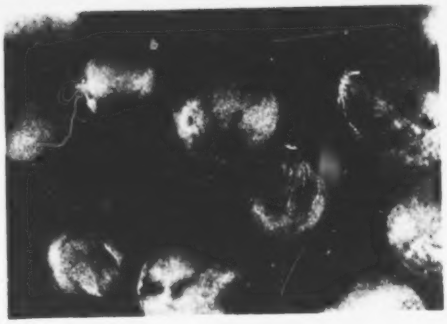


d. ______________________

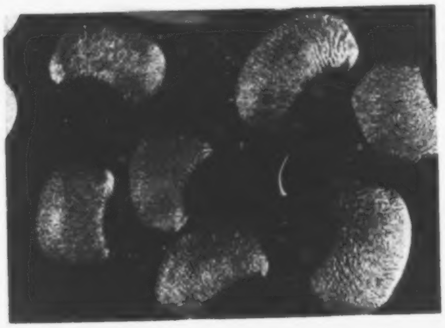
TEST



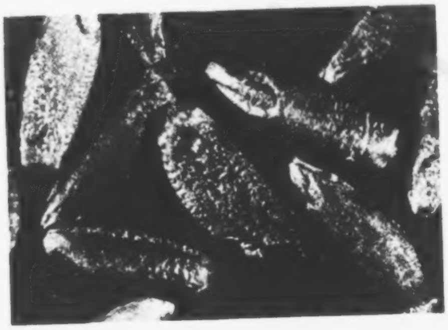
e. ______________________________



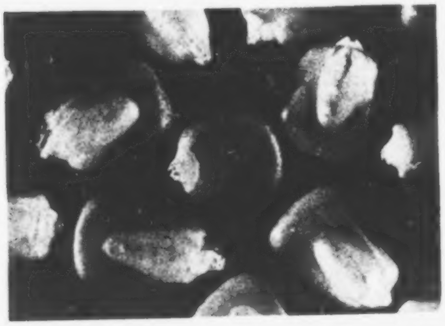
f. ______________________________



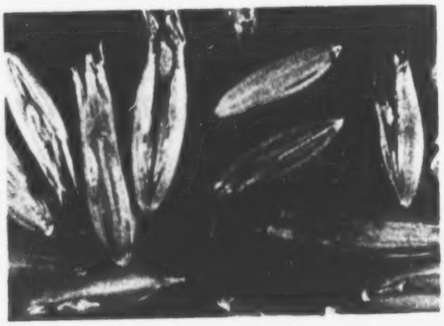
g. ______________________________



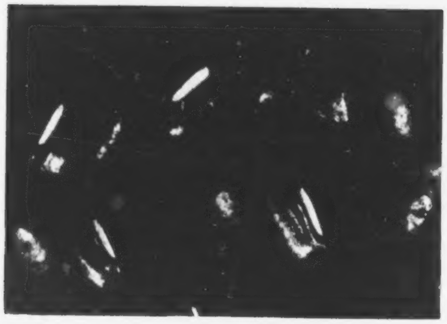
h. ______________________________



i. ______________________________



j. ______________________________



k. ______________________________

l. ______________________________

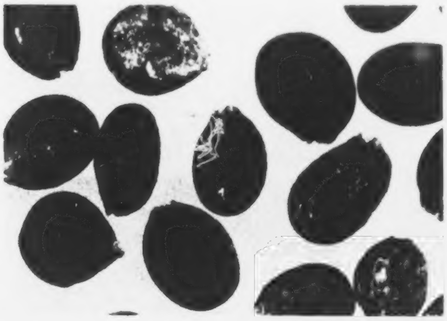
m. ______________________________

TEST

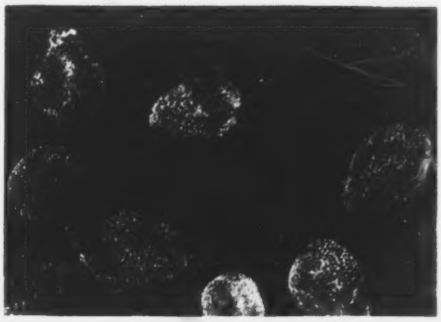
8. Identify the following seeds of selected noxious weeds. Write the correct names in the blanks below the illustrations.

Field bindweed
Whitetop (hoary cress)
Wild oat
Jointed goat grass
Wild buckwheat
Johnson grass
Common morning glory
Dodder
Cheat
Curly dock
Bracted plantain
Silverleaf nightshade

Prohibited seeds

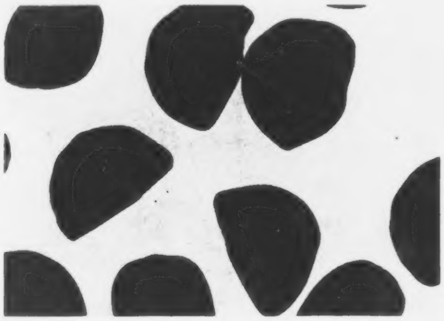


a. ______________________________

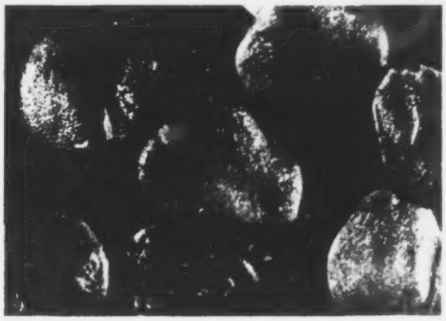


b. ______________________________

Restricted seeds

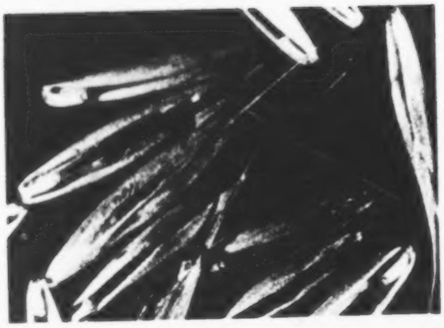


c. ______________________________

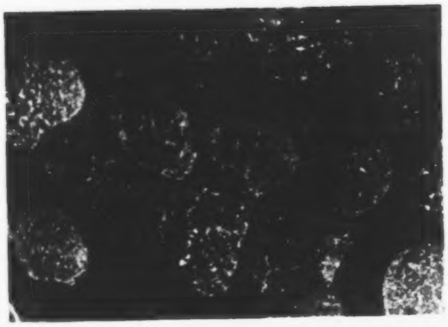


d. ______________________________

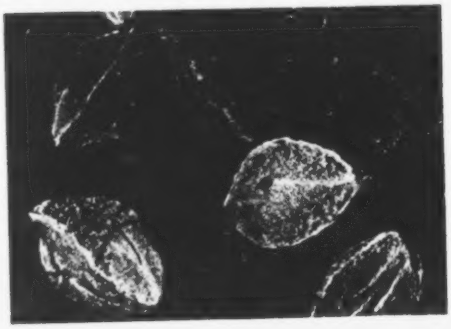
TEST



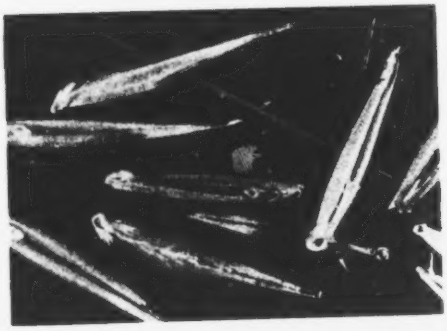
e. ______________________________



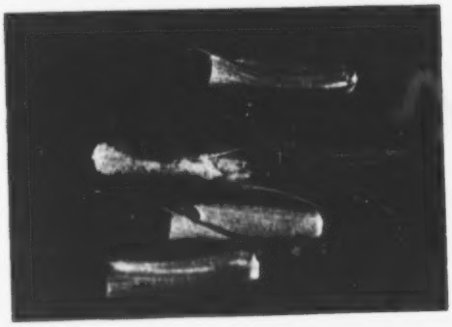
f. ______________________________



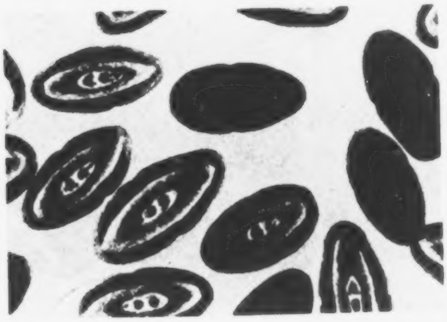
g. ______________________________



h. ______________________________

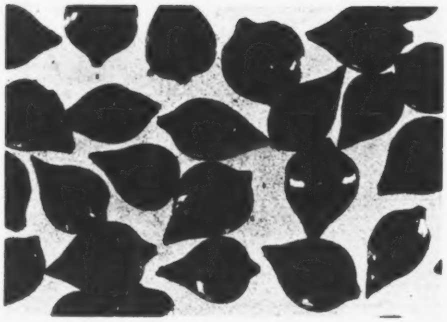


i. ______________________________

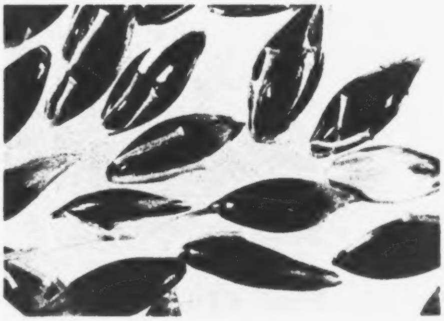


j. ______________________________

TEST



k. ______________________________



l. ______________________________

9. Match to their correct definitions terms associated with seedbed preparation. Write the correct numbers in the blanks.

_____a. Attachment used on shanks of some tillage implements to loosen top 2 to 4 inches of soil and to destroy weeds

_____b. Growing season in which land is allowed to lie idle to build up soil moisture content for following crop the next growing season

_____c. Operations performed on soil as improvement practices or as means of preparing or maintaining a seedbed or controlling weeds

_____d. Layer of soil prepared for planting seeds

_____e. Part of crop that is left on top of soil after harvesting

1. Tillage
2. Seedbed
3. Crop residue
4. Fallow period
5. Sweep

10. List six of the purposes of tillage.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

TEST

11. Name and describe common systems of tillage and seedbed preparation.

    a. Tillage

        1) ______________________________

        ____

        ____

        ____

        2) ______________________________

        ____

        ____

        ____

        3) ______________________________

        ____

        ____

        ____

    b. No-tillage — ______________________________

    ____

    ____

    ____

12. Select from the following list factors to consider in determining when to till. Write an "X" in the blank before each correct answer.

    _____a. Degree of wildlife control needed or desired

    _____b. Potential irrigating hazards that exist

    _____c. Soil type and topography

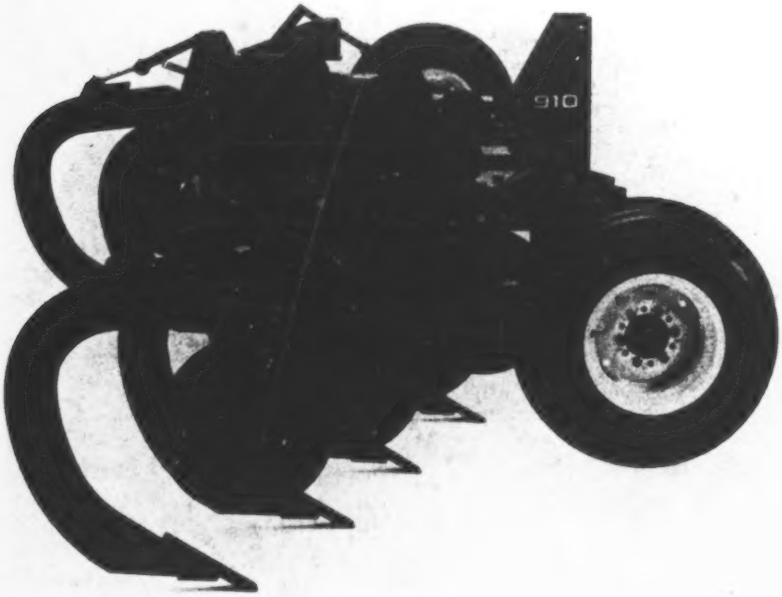
    _____d. Condition or amount of crop residue

    _____e. Soil alkali level

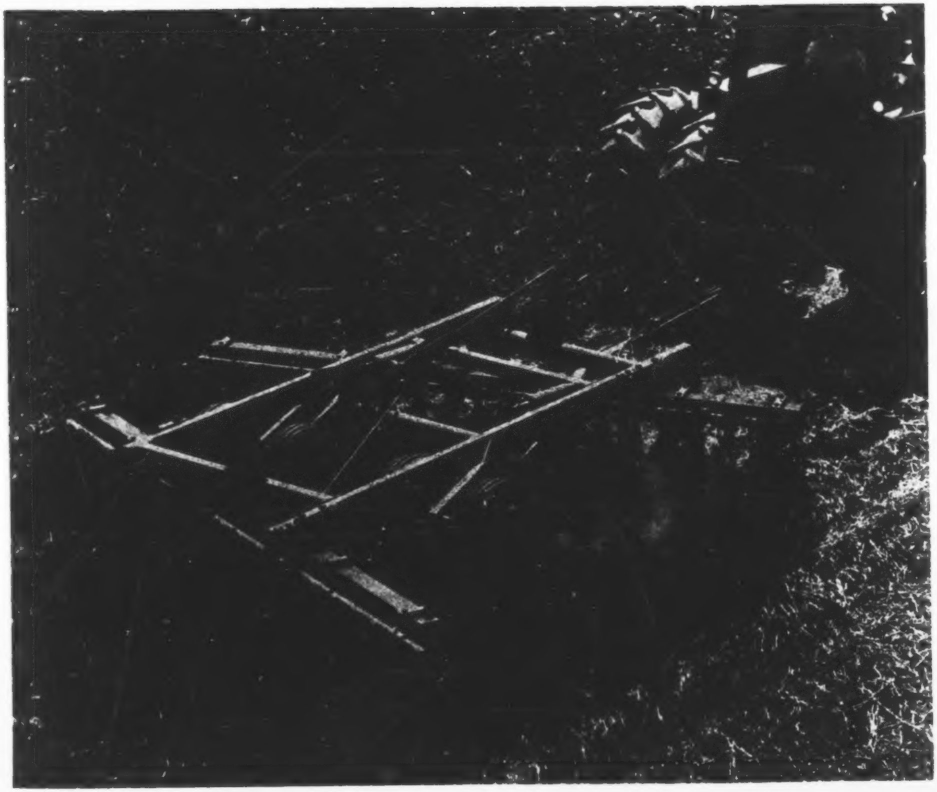
TEST

13. Match common tillage equipment to their correct descriptions and illustrations. Write the correct numbers in the blanks.

    1. Moldboard plow
    2. Chisel plow
    3. Stubble-mulch plow
    4. Offset disk
    5. Field cultivator (conditioner)
    6. Subsoiler
    7. Tandem disk

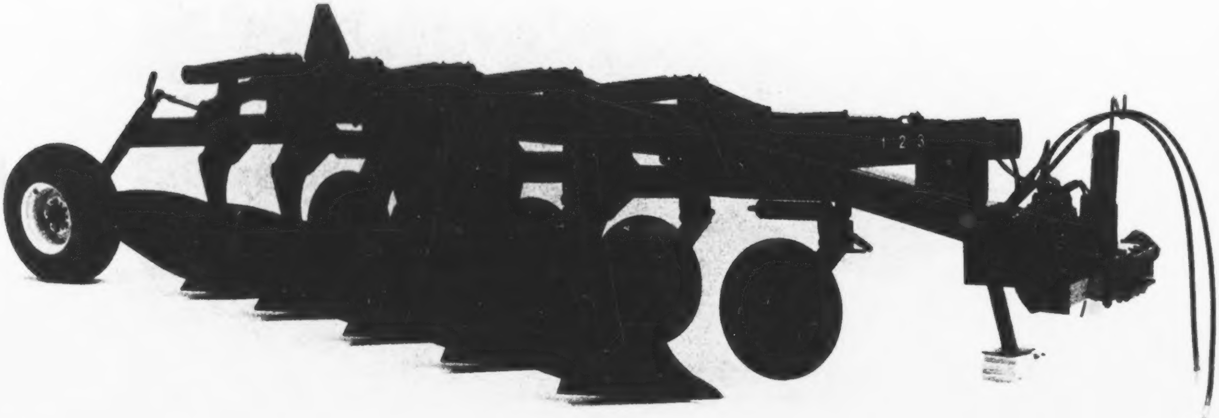


______a. A primary tillage implement that breaks the plow pan, removes very little crop residue, and is excellent for breaking up deeper soil layers beyond ordinary tillage operations; penetrates 16 to 22 inches deep and is designed with extremely strong reinforced shanks 18 to 40 inches apart



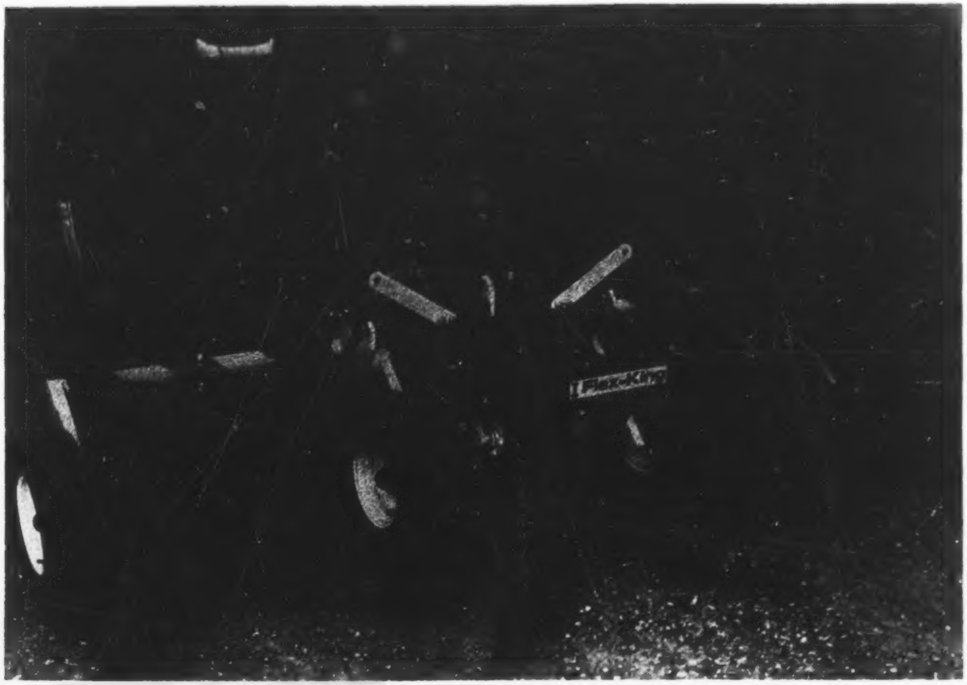
_____b. A primary or secondary tillage implement that leaves 50 to 60 percent of the crop residue, has a cutting depth of 3 to 8 inches, disk blades as large as 32 inches in diameter, and an overall width of as much as 36 feet

TEST



_____c. A primary tillage implement that breaks loose or shears off a furrow slice, inverts the soil and breaks it into lumps, removes 95 to 100 percent of the surface residue, and normally plows 6 to 12 inches deep

TEST

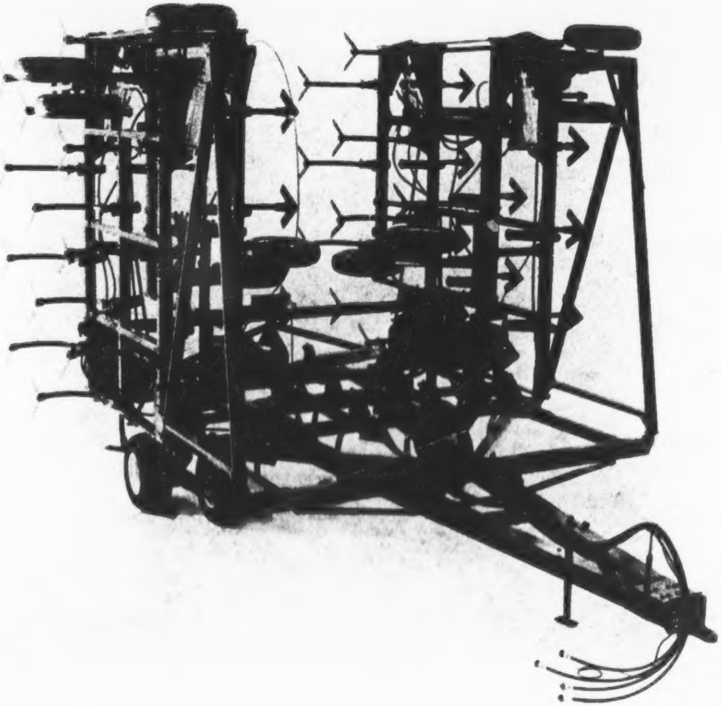


_____d. A primary or secondary tillage implement that cuts off weeds at roots approximately 3 to 4 inches deep, leaves 85 to 90 percent of the crop residue, and consists of wide sweep plows with long V-shaped sweeps

TEST

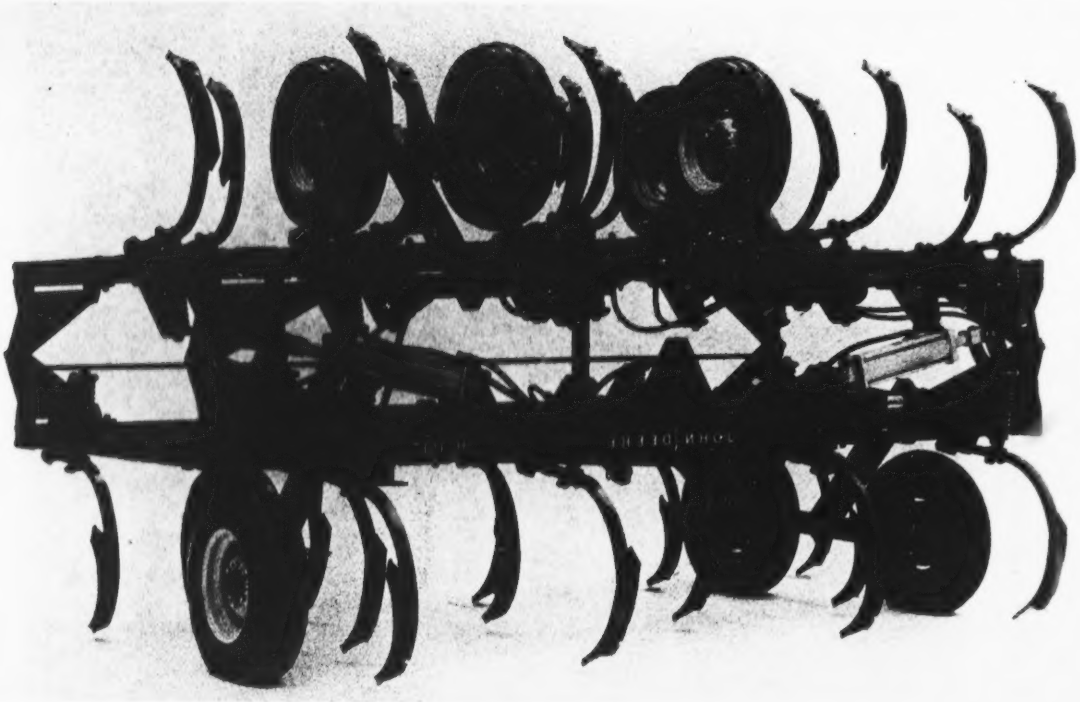
_____e. A primary or secondary tillage implement different in design but very similar in function to an offset disk

TEST



_____f. An implement used mostly for secondary tillage; similar in appearance to chisel plow, but lighter and designed for less severe operating conditions; leaves approximately 80 percent of the crop residue

TEST



______g. A primary tillage implement that rips open the soil to a maximum depth of 15 inches, leaves about 75 percent of the crop residue, and consists of 2-inch-wide shank-attached spikes spaced approximately 12 inches apart

TEST

(NOTE: Test items 14 through 16 list the assignment sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

14. Interpret seed tag analysis information.
15. Evaluate seed germination percentage.
16. Determine tillage operations and practices.

SELECT SEED AND PREPARE SEEDBED
UNIT IV

ANSWERS TO TEST

1. a. 4
   b. 10
   c. 1
   d. 6
   e. 5
   f. 7
   g. 8
   h. 9
   i. 2
   j. 3

2. a. 3
   b. 1
   c. 4
   d. 2

3. b, d, e, g

4. Discussion should include the following

   a. Not allowed to any degree in crop seeds for sale
   b. Limited to designated maximum number that may be found in 1 pound of crop seed sample
   c. Do not stop sale of seed but are not desirable

5. a. 1
   b. 10
   c. 8
   d. 5
   e. 4
   f. 9
   g. 12
   h. 11
   i. 13
   j. 3
   k. 7
   l. 6
   m. 2

6. a. Seed longevity
   b. Storage conditions
   c. Insects and pests

7. a. Clover
   b. Barley
   c. Wheat
   d. Soybean
   e. Cotton
   f. Sorghum
   g. Blackeye cowpea
   h. Rye
   i. Corn
   j. Oats
   k. Mungbean
   l. Lespedeza
   m. Alfalfa

ANSWERS TO TEST

8. **Prohibited seeds**

    a. Whitetop (hoary cress)
    b. Field bindweed

    Restricted seeds

    c. Common morning glory
    d. Silverleaf nightshade
    e. Cheat
    f. Dodder
    g. Wild buckwheat
    h. Wild oat
    i. Jointed goat grass
    j. Bracted plantain
    k. Curly dock
    l. Johnson grass

9. a. 5
    b. 4
    c. 1
    d. 2
    e. 3

10. Answer should include six of the following

    a. Preparing seedbed for new crop
    b. Destroying weeds
    c. Managing crop residues
    d. Aiding in control of insects and diseases
    e. Incorporating fertilizers into soil
    f. Maintaining favorable soil surface conditions
    g. Controlling erosion
    h. Managing soil moisture

11. Description should include the following

    a. Tillage
        1) Clean-till — Cleaning surface of residue by incorporating previous crop residue into soil with moldboard plow soon after harvest; subsequent tillage is done for weed control and seedbed preparation
        2) Stubble mulch — Using stubble-mulch plow or chisel plow soon after harvest to leave previous crop residue on soil surface throughout fallow period; subsequent tillage is done for weed control as needed
        3) Lo-till — Using sweep or chisel plow with anhydrous ammonia attachment to incorporate nitrogen into soil; herbicides are primary means of subsequent weed control

    b. No-tillage (no-till) — Planting crops in previously unprepared soil by opening a narrow slot, trench, or band only of sufficient width and depth to obtain proper seed coverage; subsequent soil preparation is not required and herbicides are used for weed control

ANSWERS TO TEST

12. c, d

13. a. 6
    b. 4
    c. 1
    d. 3
    e. 7
    f. 5
    g. 2

14. Evaluated to the satisfaction of the instructor

15. Evaluated to the satisfaction of the instructor

16. Evaluated to the satisfaction of the instructor

CONTROL CROP PESTS AND DISEASES
UNIT V

UNIT OBJECTIVE

After completing this unit, the student should be able to determine appropriate methods to control common agricultural crop pests and diseases. The student should also be able to interpret pesticide labels and calculate pesticide mixtures and costs. The student will show this ability by completing assignment sheets and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. State the definition of *integrated pest management (IPM).*
2. State the goals of integrated pest management.
3. List major factors affecting crop production.
4. Match major pest-control practices to their correct descriptions.
5. Match to their correct definitions terms associated with crop pests and diseases.
6. State ways weeds hinder crop production.
7. List ways weeds are spread.
8. Select from a list methods of controlling weeds.
9. Match classifications of herbicides to their correct descriptions.
10. Label life-cycle stages of most insects.
11. State methods of controlling insects.
12. Match classifications of insecticides to their correct descriptions.
13. Select from a list indications of plant diseases.
14. Match causes of infectious plant diseases to their correct descriptions.
15. Discuss methods of controlling plant diseases.
16. Discuss factors to consider before using agricultural chemicals on crops.
17. Discuss factors to consider when selecting and obtaining chemicals.

OBJECTIVE SHEET

18. List personal protective devices used when handling pesticides.
19. State treatments for types of pesticide exposure.
20. Select from a list factors to consider in storing and disposing of chemicals.
21. Match types of pesticide formulations to their correct definitions.
22. Match types of pesticide applicators to their correct descriptions.
23. Interpret pesticide label information.
24. Calculate pesticide mixture and cost.

CONTROL CROP PESTS AND DISEASES
UNIT V

SUGGESTED ACTIVITIES

I. Unit contents

   A. Objective sheet

   B. Suggested activities

      1. Supplement #1 — Acre-Volume Method of Calibrating Pesticide Sprayer

      2. Supplement #2 — Area-Volume Method of Calibrating Pesticide Sprayer

      3. Supplement #3 — Time-Volume Method of Calibrating Pesticide Sprayer

      4. Supplement #4 — Solve Sprayer-Calibration Problems

      5. Supplement #5 — OSU Extension Fact Sheets and Current Reports

   C. Information sheet

   D. Assignment sheets

      1. Assignment Sheet #1 — Interpret Pesticide Label Information

      2. Assignment Sheet #2 — Calculate Pesticide Mixture and Cost

   E. Answers to assignment sheets

   F. Test

   G. Answers to test

II. Instructor's guide

   A. Review unit and plan presentation.

   B. Obtain materials to supplement unit.

      1. Films

         (NOTE: The following films are available on a free-loan basis from Venard Films Ltd., Box 1332, Peoria, Illinois 61654.)

         a. *A Day in Agrichemicals Research*

            (NOTE: This film helps students understand how new crop protection chemicals are developed and focuses on careers in scientific agribusiness technology.)

SUGGESTED ACTIVITIES

b. *Accent on Accuracy*

(NOTE: This film introduces the latest principles for improving herbicide application and highlights a computer program designed to help instruct and analyze application techniques. Distribution limited to Arizona, California, Colorado, Idaho, Kansas, Minnesota, Montana, Nebraska, New Mexico, Oklahoma, Oregon, North Dakota, South Dakota, Texas, Washington, and Wyoming.)

c. *Weed Control: Your Bottom Line Depends On It!*

(NOTE: In this film extension agronomists and specialists discuss a variety of methods and materials currently available for soybean production and present new products available for weed control. Distribution is limited to Kansas, Missouri, and Oklahoma.)

d. *One-Third Ounce of Prevention*

(NOTE: This film explains how a fall application of herbicides with no-til chem fallow has had a positive impact on wheat production and explains how this approach provides easier time management, early and effective weed control, plus a higher moisture retention. Distribution is limited to Colorado, Kansas, Minnesota, Montana, Nebraska, New Mexico, Oklahoma, North Dakota, South Dakota, Texas, and Wyoming.)

e. *A New Look at Reduced Tillage Fallow*

(NOTE: This film looks at farmers in dryland wheat country who are turning to reduced tillage and chemical fallow to reduce their farming costs, to increase their cereal-grain yield and to reduce soil and moisture losses. Distribution is limited to Colorado, Kansas, Minnesota, Montana, Nebraska, New Mexico, Oklahoma, North Dakota, South Dakota, Texas, and Wyoming.)

f. *Conservation Tillage: They're Making It Pay*

(NOTE: This film tells how conservation tillage has become a tool for reducing input costs as explained at field-day demonstrations and by farmers who are "making it pay." Distribution is limited to Colorado, Kansas, Minnesota, Montana, Nebraska, New Mexico, Oklahoma, North Dakota, South Dakota, Texas, and Wyoming.)

g. *Beef and Wheat, Oklahoma's Double Crop*

(NOTE: This film shows how straw management and residual herbicides with extended weed control are earning cattle and wheat producers more income per acre. Distribution is limited to Oklahoma, Texas, Kansas, and Missouri.)

h. *The Year of the Grasshopper*

(NOTE: This film recounts 1985, as farmers and ranchers face economic disaster as an infestation of grasshoppers moves across the rangeland and crop land, devouring anything that is green.)

SUGGESTED ACTIVITIES

2. Free-loan film catalogs from John Deere Film Library, c/o Modern Talking Picture Services, Inc., 5000 Park Street North, St. Petersburg, Florida 33709.

3. *Applying Pesticides: Management, Application, Safety*. Available from the American Association for Vocational Instructional Materials, 120 Engineering Center, Athens, Georgia 30602.

   (NOTE: Oklahoma teachers may order this publication from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074. Also available from the American Association for Vocational Instructional Materials are student workbooks, teacher's guides, and audiovisual presentations.)

4. OSU Extension Fact Sheets

   (NOTE: Refer to Supplement #4 and choose those that may have information that applies to crop pests and diseases in your area. These are available from Oklahoma County Extension agents or from Central Mailing Services, Publishing and Printing East, OSU, Stillwater, Oklahoma 74078.)

5. Pesticide labels or copies of pesticide labels and instruction booklets for various pesticides

   (NOTE: These may be available at a local agricultural supply center.)

6. Competency profiles

   (NOTE: Competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Introduce unit.

SUGGESTION:

- Discuss the importance of pest and disease control, pointing out that pests and diseases are a major cause of lower quality and quantity of crops.

D. Provide students with unit.

E. Discuss unit and specific objectives.

F. Discuss information and assignment sheets.

SUGGESTED ACTIVITIES

1. Use Information Sheet, Sections I and II to discuss integrated pest management.

   SUGGESTION:

   - Use OSU Fact Sheet No. 7458, "Integrated Pest Management for Oklahoma Crops," to discuss the factors involved in an integrated pest management program.

2. Use Information Sheet, Sections III and IV to discuss the major factors affecting crop production and the major pest-control practices.

3. Use Information Sheet, Section V to discuss terms and definitions associated with crop pests and diseases.

   SUGGESTION:

   - Discuss the definitions of the terms *pesticide*, *herbicide*, and *insecticide*, pointing out that pesticide refers to chemicals used to control any type of pest and that herbicides and insecticides are types of pesticides.

4. Use Information Sheet, Sections VI and VII to discuss the ways weeds hinder crop production and the ways weeds are spread.

   SUGGESTIONS:

   - Explain to the class that not only do weeds lower the quality and quantity of the crop, but they compete for moisture, sunlight, and soil nutrients. Also explain that the value of a crop to be sold is lowered because a weed-infested crop is poorer in quality and because profits are lowered by the expense involved in controlling weeds.

   - Discuss the different ways in which weeds are spread, and explain to students that a major cause of spreading weeds is the transportation of weed seed.

5. Use Information Sheet, Sections VIII and IX to discuss the methods of controlling weeds and the classifications of herbicides.

6. Use Information Sheet, Sections X through XII to discuss insect life-cycle stages, the methods of controlling insects, and the classifications of insecticides.

   SUGGESTION:

   - Discuss the methods used to control insects and the different types of chemicals used to control insects. Explain to students that it is important to be familiar with the life-cycle stages of insects because the different methods used to control insects relate to the different life-cycle stages.

SUGGESTED ACTIVITIES

7. Use Information Sheet, Sections XIII through XV to discuss the indications of plant diseases, the causes of infectious plant diseases, and the methods of controlling plant diseases.

   SUGGESTION:

   - Explain to students that it is important to be able to recognize plant diseases. Point out that prompt identification and treatment may save a crop.

8. Use Information Sheet, Sections XVI through XIX to discuss the factors to consider before using agriculture chemicals on crops, the factors to consider when selecting and obtaining chemicals, personal protective devices, and treatments for types of pesticide exposure.

   SUGGESTIONS:

   - Explain to students that using chemicals may be a good method for controlling crop pests and diseases, but that chemicals can be harmful to humans, animals, and the environment.
   - Have a certified pesticide applicator speak to the class about factors involved in selecting chemicals for pest and disease control.
   - Discuss each type of protective device used when handling pesticides. Stress to students that these devices are very important because they guard against pesticide exposure.
   - Discuss the treatments for pesticide exposure. Stress to students the importance of learning these first-aid procedures and that knowing these treatments may prevent serious injury or death.

9. Use Information Sheet, Sections XX through XXII to discuss the factors to consider in storing and disposing of chemicals, the types of pesticide formulations, and the types of pesticide applicators.

   SUGGESTIONS:

   - Invite a certified pesticide applicator to speak to the class about safety precautions involved in handling, storing, and disposing of chemicals.
   - Have a certified pesticide applicator discuss with the class the different formulations of pesticides and the different types of pesticide applicators.
   - Hand out copies of Supplements #1, #2, #3, and #4 to students, and discuss acre-volume, area-volume, and time-volume methods of sprayer calibration.

SUGGESTED ACTIVITIES

10. Discuss Assignments Sheets #1 and #2.

    SUGGESTION:

    - Explain to students that whenever they treat a crop for pests or diseases, they will need to be able to understand the information on the pesticide label and to mix the pesticide correctly.

11. Have students complete Assignment Sheets #1 and #2.

G. Give test.

H. Critique test and discuss in class.

I. Reteach and retest if necessary.

J. Complete appropriate section of competency profiles.

III. Unit references

A. Colvin, Thomas S., and J. Howard Turner. *Applying Pesticides: Management, Application, Safety*. Athens, Georgia: American Association for Vocational Instructional Materials, 1980.

B. Metcalfe, Darrel S., and Donald M. Elkins. *Crop Production Principles and Practices*, 4th ed. New York: McMillan Publishing Co., Inc., 1980.

C. Sholar, Ron. *Integrated Pest Management for Oklahoma Crops*, OSU Extension Facts No. 7458. Stillwater, Oklahoma: Oklahoma State University, n.d.

D. *Weed Control—Cultural and Chemical*. Ohio Agricultural Education Curriculum Materials Service, 1969.

SUGGESTED ACTIVITES

SUPPLEMENT #1 — ACRE-VOLUME METHOD OF CALIBRATING PESTICIDE SPRAYER

(NOTE: The following procedure is applicable to boom-type field sprayers, but is easily adaptable to all sprayers, from small garden types to boomless and boom sprayers used for broadcast operations.)

CAUTION

Although only water is used in the calibration process, there may be some residual poison in the tank; therefore, wear approved safety equipment such as a respirator, gloves, goggles, and protective clothing. Avoid any contact with the spray. Avoid contamination of the area used for calibration.

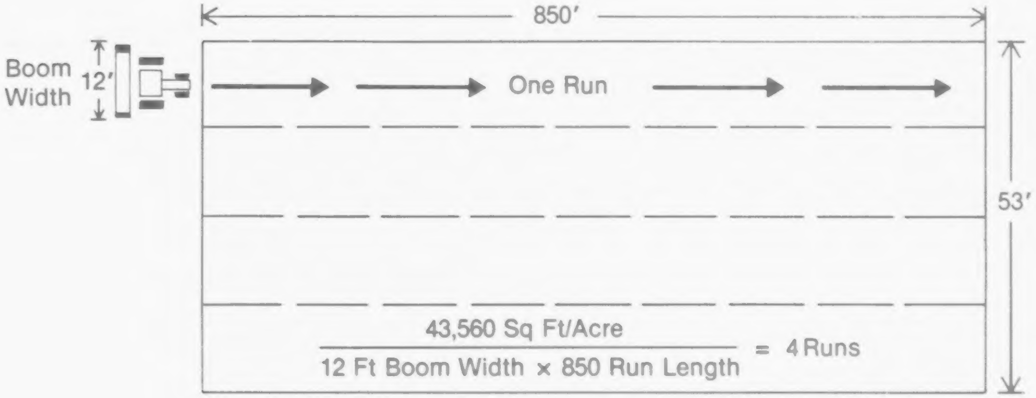
A. Measure and stake out 1 acre for the test

(NOTE: The sprayer must be calibrated on the same type of ground surface as that on which it is to operate.)

B. Determine number of runs necessary to cover the acre (See example below)

1. Select convenient length of run
2. Multiply this length times the width of the sprayer boom
3. Divide this answer into the number of square feet in an acre

EXAMPLE:



SUPPLEMENT #1

C. Position tank on level surface and fill with clean water

D. Start sprayer power unit

E. Set sprayer to recommended pressure

F. Select ground speed according to nozzle manufacturer's recommendations, or as ground condition allows

G. Before entering test area, set throttle and gear for desired speed

H. Spray test area, observing sprayer closely to ensure that speed, pressure, and nozzle output are maintained

(NOTE: Be sure to turn sprayer OFF on turns and exact points of exit, and ON at exact points of entrance.)

I. Position tank on level surface and refill to previous level, carefully measuring amount of water needed to bring tank back to original full level

(NOTE: The amount needed to refill the tank equals the amount of spray mixture that the sprayer will apply per acre at the previously set speed and pressure. If this is not the desired amount of pesticide recommended, change the rate of application and recheck.)

J. Change rate of application—if necessary—by performing one of the following procedures

1. Change operating pressure and retest

   (NOTE: Lowering the operating pressure reduces the volume of spray delivered; raising the operating pressure increases the volume delivered.)

2. Change ground speed and recheck

   (NOTE: A change in ground speed is the easiest way to obtain a small change in the application rate. The faster the ground speed, the less volume applied per acre; the slower the ground speed, the more volume applied per acre.)

3. Change nozzle tip size

   (NOTE: When a major change in the application rate is desired, change the nozzle tip size. The larger the tip, the more volume; the smaller the tip, the less volume.)

K. Calculate the area that can be sprayed with one tankful of spray mixture by dividing volume capacity of tank by amount sprayed per acre

EXAMPLE: If the tank holds 100 gallons and you sprayed 5 gallons per acre, one tankful would cover 20 acres.

$$\frac{\text{100 Gal/Tankful}}{\text{5 Gal/Acre}} = \text{20 Acres/Tankful}$$

SUGGESTED ACTIVITES

SUPPLEMENT #2 — AREA-VOLUME METHOD OF CALIBRATING PESTICIDE SPRAYER

(NOTE: The following procedure is applicable to boom-type field sprayers, but is easily adaptable to all sprayers, from small garden types to boomless and boom sprayers used for broadcast operations. Calculations are rounded to the nearest tenth unless otherwise noted.)

CAUTION

Although only water is used in the calibration process, there may be some residual poison in the tank; therefore, wear approved safety equipment such as a respirator, gloves, goggles, and protective clothing. Avoid any contact with the spray. Avoid contamination of the area used for calibration.

A. Measure and stake out test area

(NOTE: The test area may be several short runs, but must still total the correct length.)

1. If broadcast spraying, stake an area about 1000 feet long
2. If using band application, stake an area about 2000 feet long

B. Position tank on level surface and fill with clean water

C. Start sprayer power unit

D. Set sprayer to recommended pressure

E. Select ground speed according to nozzle manufacturer's recommendations, or as ground condition allows

F. Before entering test area, set throttle and gear for desired speed

G. Spray test area, observing sprayer closely to ensure that speed, pressure, and nozzle output are maintained

(NOTE: Be sure to turn sprayer OFF on turns and exact points of exit, and ON at exact points of entrance.)

H. Position tank on level surface and refill to previous level, carefully measuring amount of water needed to bring tank back to original full level

(NOTE: The amount needed to refill the tank equals the amount of spray mixture that the sprayer will apply per acre at the previously set speed and pressure.)

I. Calculate the rate of application, using the most applicable of the following procedures

1. If *broadcast spraying*, find the area sprayed by using the following formula

$$\frac{\text{Width of Sprayer Swath} \times \text{Length of Run}}{\text{43,560 Sq Ft/Acre}} = \text{Area Sprayed (rounded to nearest hundredth)}$$

EXAMPLE: $\frac{14 \times 1000}{43{,}560} = .32$ Acre Sprayed

SUPPLEMENT #2

a. Find application rate or gallons per acre by dividing number of gallons used by number of acres sprayed

EXAMPLE: You used 6 gallons of water to spray .32 acres—

$6 \div .32 = 18.8$ Gallons per Acre

b. Recheck your calculations

c. Find area that can be sprayed with one tankful by dividing volume capacity of tank by amount sprayed per acre

EXAMPLE: For a tank that holds 100 gallons—

$100 \div 18.8 = 5.3$ Acres per Tankful

2. If using *band application* method, find area sprayed in bands by using the following formula

$$\frac{\text{Band Width} \times \text{No. of Bands in Swath} \times \text{Length of Run}}{\text{43,560 Sq Ft per Acre}} = \text{Area Sprayed in Bands (rounded to nearest hundredth)}$$

EXAMPLE: If band is 12 inches wide, there are 6 bands, and the run length is 1000 feet—

$$\frac{\text{1 Ft} \times 6 \times \text{1000 Ft}}{\text{43,560 Sq Ft per Acre}} = \text{.14 Acre Sprayed}$$

a. Find rate of application or number of gallons per acre by dividing number of gallons used by number of acres sprayed

EXAMPLE: You used 5 gallons of water to spray .14 acres

$5 \div .14 = 35.7$ Gallons per Acre

b. Recheck your calculations

c. Find area that can be sprayed with one tankful by dividing volume capacity of tank by amount sprayed per acre

EXAMPLE: For a tank that holds 100 gallons—

$100 \div 35.7 = 2.8$ Acres per Tankful

J. Change rate of application—if necessary—by performing one of the following procedures

1. Change operating pressure and retest

(NOTE: Lowering the operating pressure reduces the volume of spray delivered; raising the operating pressure increases the volume delivered.)

SUPPLEMENT #2

2. Change ground speed and recheck

   (NOTE: A change in ground speed is the easiest way to obtain a small change in the application rate. The faster the ground speed, the less volume applied per acre; the slower the ground speed, the more volume applied per acre.)

3. Change nozzle tip size

   (NOTE: When a major change in the application rate is desired, change the nozzle tip size. The larger the tip, the more volume; the smaller the tip, the less volume.)

SUGGESTED ACTIVITES

SUPPLEMENT #3 — TIME-VOLUME METHOD OF CALIBRATING PESTICIDE SPRAYER

(NOTE: The following procedure is applicable to band-type field sprayers and broadcast-type field sprayers, but the calculations are based upon a sprayer with 40-inch nozzle spacing. Calculations are rounded to the nearest tenth unless otherwise noted.)

CAUTION

Although only water is used in the calibration process, there may be some residual poison in the tank; therefore, wear approved safety equipment such as a respirator, gloves, goggles, and protective clothing. Avoid any contact with the spray. Avoid contamination of the area used for calibration.

A. Measure and stake out test area 100 feet long

B. Position tank on level surface and fill with clean water

(NOTE: You will not be spraying during the test runs.)

C. Establish ground speed before entering test area, maintaining speed until exiting

D. Mark throttle position for future reference

E. Record amount of time necessary to cover test area

F. Make 3 or 4 runs of test area at established speed

G. Average time totals

H. Park tractor with sprayer on level ground

I. With tractor running, set sprayer pressure according to manufacturer's recommendations

J. Place calibrated glass containers of same size under each nozzle

K. Turn sprayer ON and let run for exact time of average obtained by test runs; then turn OFF

L. Calculate average output of nozzles in ounces

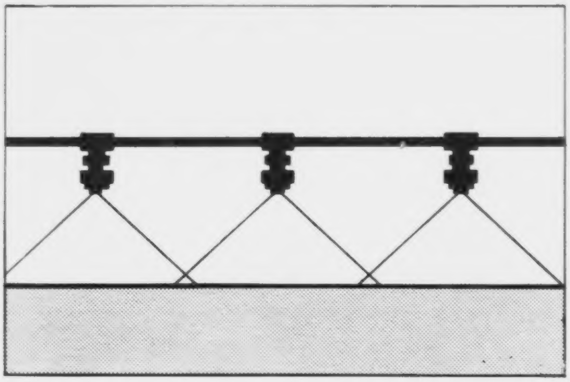
M. Find application rate by using Table A and the most appropriate of the following methods

TABLE A

Band and Row Width (Inches)	8	10	12	14	16	18	22	24	28	30	32	34	36	38	40	42	46	48
Conversion Factor	5.00	4.00	3.34	2.86	2.50	2.22	1.82	1.66	1.43	1.33	1.25	1.18	1.11	1.05	1.00	.95	.91	.83

SUPPLEMENT #3

1. Row and broadcast application method



Even spacing of nozzles provides even spray patterns.

   a. Find width of row in inches

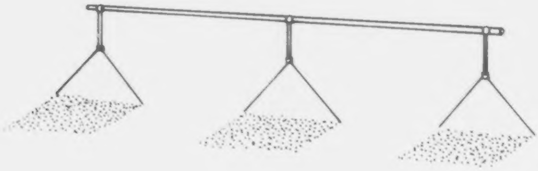
   b. Using Table A, find conversion factor under corresponding row width

   c. Multiply conversion factor times average nozzle output

   EXAMPLE: For a 30-inch row width with a 1.33 conversion factor and a 6-ounce average nozzle output—

   1.33 × 6 = 8 Gal/Acre

2. Band application method



   a. Find sprayer coverage on actual band width

   b. Using Table A, find conversion factor under corresponding band width

SUPPLEMENT #3

c. Multiply conversion factor times average nozzle output

(NOTE: If you have more than one nozzle per band or row, multiply average nozzle output time number of nozzles per band or row.)

EXAMPLE: For a 14-inch band with a 2.86 conversion factor and a 6-ounce average nozzle output

$$6 \times 2.86 = 17.2 \text{ Gal/Acre}$$

N. Change rate of application—if necessary—by performing one of the following procedures

1. Change operating pressure and retest

   (NOTE: Lowering the operating pressure reduces the volume of spray delivered; raising the operating pressure increases the volume delivered.)

2. Change ground speed and recheck

   (NOTE: A change in ground speed is the easiest way to obtain a small change in the application rate. The faster the ground speed, the less volume applied per acre; the slower the ground speed, the more volume applied per acre.)

3. Change nozzle tip size

   (NOTE: When a major change in the application rate is desired, change the nozzle tip size. The larger the tip, the more volume; the smaller the tip, the less volume.)

O. Calculate number of acres that can be sprayed with one tankful by dividing tank capacity by gallons applied per acre

EXAMPLES: Using row width application rate of 8 gallons per acre and a tank with a 100-gallon capacity, one tankful would cover 12.5 acres:

$$\frac{100 \text{ Gal/Tankful}}{8 \text{ Gal/Acre}} = 12.5 \text{ Acres/Tankful}$$

Using band width application rate of 17 gallons per acre and a tank with a 100-gallon capacity, one tankful would cover 5.9 acres:

$$\frac{100 \text{ Gal/Tankful}}{17 \text{ Gal/Acre}} = 5.9 \text{ Acres/Tankful}$$

SUGGESTED ACTIVITES

SUPPLEMENT #4 — SOLVE SPRAYER-CALIBRATION PROBLEMS

NAME ______________________________ SCORE ______________

Accurate sprayer calibration is very important in the control of crop pests and diseases. Inaccurate calibration can result in crop loss due to failure to kill either the pests or the disease, can cause a chemical imbalance that can kill the crop as well as the pest or disease, and can expose the user to dangerous amounts of toxic chemicals.

The following problems are designed to allow you ample practice in solving problems in calibrating field sprayers. Work the following problems, and round your answers to the nearest tenth unless otherwise noted. When you have completed this assignment, check your answers with those of your neighbor and discuss in class.

A. How many acres are there in a field 400 feet wide and 900 feet long? Use the formula below.

$$\text{Acres} = \frac{\text{Length} \times \text{Width}}{43{,}560\ \text{Ft}^2/\text{Acre}}$$

Acres = ______________________

B. How many acres are there in a field 200 feet wide and 500 feet long? Use the formula below.

$$\text{Acres} = \frac{\text{Length} \times \text{Width}}{43{,}560\ \text{Ft}^2/\text{Acre}}$$

Acres = ______________________

SUPPLEMENT #4

C. You have determined that the length of your test run is 500 feet. Your boom swath is 12 feet wide. Using the acre-volume method, find how many runs per acre are necessary. Use the formula below.

$$\text{Runs/Acre} = \frac{43{,}560\ \text{Ft}^2/\text{Acre}}{\text{Length of Run} \times \text{Width of Boom Swath}}$$

Runs/Acre = ______________________

D. Find the rate per acre in gallons, assuming that in problem C you used 6 gallons to refill your tank.

Gallons/Acre = ______________________

E. Your test area is 800 feet long and your boom swath is 8 feet wide. Using the acre-volume method, how many runs will it take to cover an acre? Use the formula below.

$$\text{Runs/Acre} = \frac{43{,}560\ \text{Ft}^2/\text{Acre}}{\text{Length of Run} \times \text{Width of Boom Swath}}$$

Runs/Acre = ______________________

SUPPLEMENT #4

F. You have sprayed an area that is 1000 feet long, and your swath width is 12 feet. Using the area-volume method and the formula below, find the area sprayed. Round answer to the nearest hundredth.

$$\text{Area Sprayed} = \frac{\text{Length of Run} \times \text{Width of Boom Swath}}{43{,}560\ \text{Ft}^2/\text{Acre}}$$

Area Sprayed = ______________________

G. Assuming that you sprayed 8 gallons on the test area found in problem F, what is the application rate in gallons per acre? Use the formula below.

$$\text{Gallons/Acre} = \frac{\text{Gallons Used}}{\text{Acres Sprayed}}$$

Gallons/Acre = ______________________

H. Assume that you have 6 bands in each swath with a band width of 12 inches (1 foot). The length of your test run is 1250 feet. Using the formula below, find the area sprayed in bands. Round answer to the nearest hundredth.

$$\text{Area Sprayed in Bands} = \frac{\text{Number of Bands in Swath} \times \text{Band Width} \times \text{Length of Run}}{43{,}560\ \text{Ft}^2/\text{Acre}}$$

Area Sprayed in Bands = ______________________

SUPPLEMENT #4

I. Assuming that you sprayed 4 gallons on the test area found in problem H, what is the application rate in gallons per acre? Use the formula below.

$$\text{Gallons/Acre} = \frac{\text{Gallons Used}}{\text{Acres Sprayed}}$$

Gallons/Acre = ______________________________

J. Your sprayer has an average nozzle output of 7 ounces. The row width is 24 inches, and the length of run is 100 feet. Using the time-volume method and the formula below, find the number of gallons sprayed per acre.

Gallons/Acre = Ounces/Nozzle × Conversion Factor 1.66

Gallons/Acre = ______________________________

ANSWERS TO SUPPLEMENT #4

A. 8.3 acres
B. 2.3 acres
C. 7.3 runs per acre
D. 6 gallons per acre
E. 6.8 runs per acre
F. .28 acres
G. 28.6 gallons per acre
H. .17 acres
I. 23.5 gallons per acre
J. 11.6 gallons per acre

SUGGESTED ACTIVITES

SUPPLEMENT #5 — OSU EXTENSION FACT SHEETS AND CURRENT REPORTS

(NOTE: The fact sheets and current reports listed below may be used as additional sources of information in the study of controlling crop pests and diseases. These may be obtained from Oklahoma County Extension agents or from Central Mailing Services, Publishing and Printing East, OSU, Stillwater, Oklahoma 74078.)

No. 7150	Alfalfa Forage Insect Control
No. 7154	Worm Pests of Oklahoma Cotton
No. 7157	Field Key to Larvae in Sorghums
No. 7162	Cotton Insect Control — 1985
No. 7166	Control of the Alfalfa Weevil in Oklahoma
No. 7167	Soybean Insect Survey and Control in Oklahoma
No. 7168	Plant Gall Caused by Insects
No. 7169	Potato Disease Prevention and Control
No. 7170	Control of Sorghum Insects
Current Report	Insect Control of Farm-Stored Grains
No. 7174	Peanut Insect Control in Oklahoma
No. 7176	Insects on Small Grains and Their Control
Current Report	CR-7177 Scouting for the Alfalfa Weevil in Oklahoma
Current Report	CR-7179 Integrated Control of the Alfalfa Weevil
No. 7180	Stored-Grain Insect Control in Oklahoma
No. 7306	Ornamental and Lawn Pest Control
No. 7310	Pests of Ornamental Shrubs and Trees
No. 7313	Home Garden Insect Control
No. 7314	Control of Diseases and Nematodes in the Home Garden
No. 7451	Agricultural Pesticide Storage
No. 7453	First Aid for Pesticide Poisoning
No. 7454	Check Your Pesticide Labels
No. 7455	Pesticide Applicator Certification
No. 7457	Toxicity of Pesticides
No. 7458	Integrated Pest Management for Oklahoma Crops
No. 7609	Leaf Rust and Stem Rust of Wheat
Current Report	CR-7619 Peanut Disease Control Guide — 1985
No. 7622	Wheat Root Rots
No. 7624	Tan Spot of Wheat
No. 7629	Wheat Soil-Borne Mosaic Virus Disease
No. 7631	Bunt and Loose Smut Diseases of Wheat
No. 7633	Powdery Mildew of Wheat
No. 7636	Wheat Streak Mosaic Virus Disease
No. 7450	Safe Use of Pesticides in the Home and Garden

CONTROL CROP PESTS AND DISEASES
UNIT V

INFORMATION SHEET

I. Integrated pest management (IPM) — Program combining biological-, cultural-, genetic-, and chemical-control methods to hold pest numbers or their damage below economically important levels

II. Goals of integrated pest management

  A. To improve pest control

  (NOTE: Using an integrated system of pest control provides a more effective pest-control program than using a single-method program.)

  B. To make crop protection more economical

  (NOTE: When using an integrated system, you treat for pests only when the need for treatment is identified, rather than treating crops on a regular calendar basis as you would when using a single-method program.)

  C. To protect the environment

  (NOTE: IPM practices safeguard human health while preserving the natural balance within the environment.)

III. Major factors affecting crop production

  A. Weeds

  B. Insects

  C. Diseases

IV. Major pest-control practices and their descriptions

  A. Cultural practice — Using mechanical practices initiated by humans to alter or in some way adversely affect a crop pest

  EXAMPLES: Practicing crop rotation, creating crop competition, planting high-quality seed, practicing conventional soil cultivation, practicing flame cultivation, mowing, using pasturing techniques, planting at appropriate times, planting in a disease-free area

  B. Genetic practice — Using plant breeding practices that result in controlling a crop pest

  EXAMPLES: Planting insect-resistant crops, planting disease-resistant crops

INFORMATION SHEET

C. Biological practice — Using living organisms to control a crop pest

(NOTE: Sometimes a living organism is introduced into a crop to feed upon a crop pest. For example, insects, mites, worms, and birds have been introduced into a crop to feed upon harmful insects, and insects and birds have been introduced into a crop to feed upon weeds.)

D. Chemical practice — Using man-made compounds to control a crop pest

EXAMPLES: Applying herbicides, insecticides, and special pesticides for disease control

V. Terms and definitions associated with crop pests and diseases

A. Pesticide — Any chemical used for killing insects, weeds, or diseases

(NOTE: There are many names for the different types of pesticides, but most pesticide names are derived either from the kinds of pests they control [*insecticide, fungicide*] or from the life-cycle stage of the insect they affect [*ovicide, larvicide*].)

B. Herbicide — Pesticide used to destroy plants, especially weeds, or to check their growth

C. Insecticide — Pesticide used to kill insects

D. Fungicide — Pesticide used to kill fungi

E. Systemic pesticide — Agent that affects the entire organism it controls by spreading from point of entrance throughout organism's system

F. Contact pesticide — Agent that kills or affects pest when pest comes in contact with it

VI. Ways weeds hinder crop production

A. Compete with crop for moisture

B. Compete with crop for sunlight

C. Compete with crop for soil nutrients

D. Harbor insects and diseases

E. Promote molding and spoilage in stored grains

F. Reduce crop yield

INFORMATION SHEET

G. Reduce crop quality

(NOTE: Weed-infested crops can cause low-quality farm products. For example, weeds in livestock feed lower its quality and its market value, and weeds in feed eaten by dairy cows can affect the odor and taste of the dairy products made from their milk, thereby lowering their quality.)

H. Reduce crop value

(NOTE: It is easy to see that one poor-quality, weed-infested crop will reduce profit by bringing a lower price, but also be aware that profit is reduced even further when time and money must be spent to control weeds to prevent a poor quality crop the following year.)

VII. Ways weeds are spread

(NOTE: Weeds are spread either by their own reproductive processes, or they are spread to other locations by carriers [wind, water, animals] that transport the weed seed.)

A. Vegetative reproduction of seed, roots, stems, leaves, or bulbs

B. Wind

C. Water

D. Humans

E. Animals

F. Equipment

VIII. Methods of controlling weeds

A. Planting high-quality crop seed

(NOTE: High-quality seed is certified to be free of weed seed.)

B. Practicing crop rotation

(NOTE: When crop rotation is practiced, weeds are controlled because weeds that grow in the first crop that is planted may not be able to adapt to the growing conditions of the next crop planted.)

C. Creating crop competition

(NOTE: In crop competition, a rapidly growing crop is planted because of its ability to smother out weeds.)

INFORMATION SHEET

D. Practicing conventional soil cultivation

(NOTE: When conventional soil cultivation is practiced, weeds are killed when their root systems are exposed or cut.)

E. Practicing flame cultivation

(NOTE: In flame cultivation, weeds are controlled by burning them from a planted field or from waste areas such as ditches and roadsides. This method of weed control is more effective on small annual weeds and on weeds found in crops with woody stems, which are more resistant to flame damage. Effective flame cultivation in a planted field requires that the burners be adjusted properly and that the equipment be moved through the field at the correct speed.)

F. Mowing

(NOTE: Mowing is an effective method of controlling weeds if weeds are mowed before their seed pods can form.)

G. Pasturing techniques

(NOTE: Animals eat many kinds of weeds, and therefore, pasturing animals can be an effective method of controlling weeds. However, pasturing animals after the weeds have gone to seed is not an effective method of control because seeds will be spread after being passed through the animals' digestive systems.)

H. Applying herbicides

IX. Classifications of herbicides and their descriptions

A. Contact herbicide — Herbicide that kills only the parts of the plant that it covers

(NOTE: Contact herbicides may be either *selective* or *nonselective*. Selective herbicides affect some plants without harming others. Nonselective herbicides affect all plants with which they come in contact.)

B. Translocated herbicide (systemic herbicide) — Herbicide that moves within a plant from a point of entry and affects the entire plant

(NOTE: Most herbicides used for weed control in field crops are translocated herbicides.)

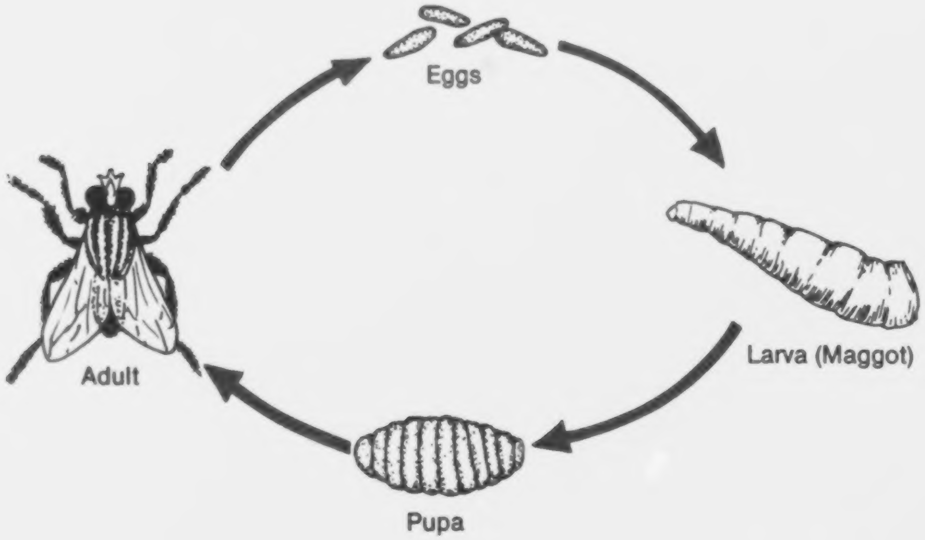
C. Soil sterilant — Agent that prevents any plant growth in the soil

(NOTE: Soil sterilants are often used for controlling weeds along fence rows and building foundations.)

INFORMATION SHEET

X. Life-cycle stages of most insects

(NOTE: Most insects go through the four stages listed below; others only go through three. Knowing these stages is important because some insecticides and other control methods are designed to kill insects at a certain life-cycle stage.)



XI. Methods of controlling insects

A. Practicing timely cultivation

(NOTE: When a field is cultivated at the proper times, the number of insects in it can be reduced by crushing or burying the insects, by eliminating host plants, or by bringing insects to the surface where they are then killed by cold weather.)

B. Practicing crop rotation

(NOTE: Crop rotation controls insects by removing their host crop; whereas, growing the same crop year after year increases the population of the particular insects that are common to that crop.)

C. Using pasturing techniques

(NOTE: Pasturing animals on a field controls insects by removing the crop residue that serves as the insects' place of wintering.)

INFORMATION SHEET

- D. Planting insect-resistant crops

  (NOTE: Genetic research has developed new varieties of plants that are resistant to or tolerant of insects.)

- E. Introducing organisms that feed on pest insects
- F. Using insecticides

XII. Classifications of insecticides and their descriptions

- A. Stomach poison — Insecticide that kills when treated plant material reaches the insect's stomach; used to control chewing insects
- B. Contact poison — Insecticide that kills by penetrating insect's body either directly or by entering its breathing or sensory pores; used to control piercing or sucking insects
- C. Sterilizing agent — Insecticide that prevents insect reproduction through sterilization of the insect

XIII. Indications of plant diseases

(NOTE: Diseases can affect any part of a plant [roots, stems, leaves, flowers, or fruit] at any stage in the plant's development [seed, seedling, or mature plant]. And the symptoms of one disease affecting a plant are different than the symptoms of another disease. Therefore, the crop producer must be familiar with the general indications of plant disease so that disease will be readily recognized and the plants can be treated promptly.)

- A. Changes in color

  (NOTE: *Chlorosis* is the scientific term for changes in plant color, such as when green leaves lose their color or turn yellow.)

- B. Holes in leaves
- C. Wilting
- D. Death of plant tissue

  (NOTE: *Necrosis* is the scientific term for the death of plant tissue.)

- E. Stunted growth
- F. Galls

  (NOTE: Galls are swollen spots on the plant tissue.)

INFORMATION SHEET

G. Shriveling and dying fruit

H. Dropping leaves, blossoms, and fruits

I. Malformations

J. Rots

K. Seepage

XIV. Causes of infectious plant diseases and their descriptions

A. Fungi — Living plants that lack chlorophyll and must obtain their food from other living plants or decaying organic matter

(NOTE: Fungi are responsible for a great number and variety of plant diseases, and they can attack any part of a plant. Some diseases that are caused by fungi are stem rust in wheat, leaf blight in corn, smut diseases in grasses, and root and stem rot in soybeans.)

B. Bacteria — Microscopic, single-celled plants that are borne inside seed or enter a plant through natural openings or injured tissue

(NOTE: Compared to the number of major diseases caused by fungi, the number of diseases caused by bacteria is small. Some bacterial diseases are wilt in alfalfa, wilt in tobacco, leaf blight in rice, and angular spot in cotton.)

C. Viruses — Submicroscopic infectious entities that multiply only inside living host cells

(NOTE: Few living organisms are immune from viruses, and plants can be attacked by one or more viruses at the same time. Diseases such as soybean mosiac, common mosiac in beans, dwarf maize mosiac, and streak and barley strip mosiac in small grains are caused by viruses.)

D. Parasitic seed plants — Plants that obtain their food from crop plants

(NOTE: Some parasitic seed plants are mistletoe, dodder [which attacks alfalfa and clovers], and witchweed [which lives on the roots of corn, sorghum, sugarcane, rice, rye, and oats].)

E. Nematodes — Slender, microscopic eelworms that usually live in the soil, but will attack small plant roots and kill the plant by feeding on its cells and by secreting toxic saliva

XV. Methods of controlling plant diseases

A. Planting disease-resistant plant varieties

B. Planting at times when disease is ineffective, rare, or absent

INFORMATION SHEET

C. Planting in an area where disease is ineffective, rare, or absent

D. Preventing the introduction or establishment of disease within a disease-free area

E. Eliminating disease from a region or from an individual plant variety in which disease is established

F. Using chemical pesticides to protect plants from disease

G. Using chemical or nutritional treatments to reduce the severity of disease in infected plants

XVI. Factors to consider before using agricultural chemicals on crops

A. Chemical use is a quick and sure means of controlling pests and diseases

B. Chemical use can replace some tillage operations

C. Chemical use is expensive and may reduce the crop producer's margin of profit

D. Repeated chemical use can make disease organisms become resistant to chemicals

E. Chemical use may damage or endanger the environment and may be toxic to the applicator

(NOTE: Strict laws have been established to control the use of certain chemicals, and strict measures should be followed when you are dealing with any type of agricultural chemical.)

XVII. Factors to consider when selecting and obtaining chemicals

A. Identify the pest you intend to control

B. Know your means and limits for applying a chemical

(NOTE: Equipment needed for application must be available, and hazards to humans, livestock, or surrounding crops must be considered.)

C. Prepare the information you will need to determine the quantity of chemical you will need

D. Consult a reputable chemical dealer or supplier

(NOTE: On the market today are numerous agricultural chemicals, and new chemicals are constantly being developed. Therefore, keeping current on agricultural chemicals is a complex problem—a problem that becomes even more complex when chemicals are also known by their brand names. It is helpful to be familiar with some common chemical names, but with so many products on the market, it is best to consult a reputable dealer or supplier who will guide you in making the best possible chemical purchase.)

INFORMATION SHEET

E. Determine whether selected pesticide is for restricted or general use

(NOTE: Restricted-use pesticides can be obtained only by a certified applicator; however, anyone can use pesticides intended for general use.)

XVIII. Personal protective devices used when handling pesticides

(NOTE: Label directions list protective devices that should be worn when handling the pesticide. *Always* follow these directions.)

A. Coveralls or long-sleeved shirt and long pants

B. Raincoat or liquid-proof apron

C. Boots made of unlined neoprene

D. Long gloves made of unlined neoprene

(NOTE: Gloves should be long enough to protect wrists.)

E. Goggles or face shield

F. Respirator

(NOTE: There are three major types of respirators: cartridge, cannister, and self-contained. It is important that the respirator fit properly around the face to prevent leakage. Be sure to check the respirator's labels for specific directions.)

XIX. Treatments for types of pesticide exposure

(NOTE: Being familiar with first-aid procedures is important because quick action may prevent serious injury or death. After exposure to a pesticide, *always* get medical attention as quickly as possible.)

A. Pesticide in the eyes — Immediately flush eyes with low-pressure running water for at least fifteen minutes; call a physician

B. Pesticide on the skin — Remove contaminated clothing, including shoes; wash skin and hair with detergent and plenty of water; call a physician

C. Pesticide swallowed — Check pesticide label to see if vomiting should be induced; take care that person does not strangle; get medical help as quickly as possible

D. Pesticide inhaled — Move patient to fresh air and have him or her lie down; loosen patient's clothing; keep patient warm and quiet; apply artificial respiration if breathing stops; get medical help as quickly as possible

INFORMATION SHEET

XX. Factors to consider in storing and disposing of chemicals

A. Read the chemical's label for specific storage directions

(NOTE: Generally, a chemical is stored out of direct sunlight and in a cool, dry, well-ventilated area.)

B. Store chemicals in their original containers with labels left intact

C. Store chemicals in a fire-resistant cabinet

D. Keep chemical-storage area locked

E. Identify a chemical-storage area with a sign stating that dangerous chemicals are stored there

F. Do not store or transport chemicals with food, feed, seed, or animals

G. Dispose of chemicals according to label directions

XXI. Types of pesticide formulations and their definitions

(NOTE: *Formulation* means "the form in which a pesticide is offered for sale by the manufacturer.")

A. Liquid formulations

1. Emulsifiable concentrate — Concentrated liquid chemical that when applied is mixed with water and is constantly agitated to maintain a suspension

2. Solution — Liquid chemical that is ready to be used as purchased and is not mixed with water

3. Flowable — Paste-like yet pourable chemical that when applied is mixed with water and is constantly agitated to maintain a suspension

4. Fumigant — Liquid chemical that is placed under pressure and applied as a gas

5. Aerosol — Liquid chemical that is placed under pressure and applied as a fog or mist

B. Dry formulations

1. Dust — Dry chemical ingredient added to a fine powder that is applied directly to plants in its dry form

INFORMATION SHEET

2. Granule — Dry chemical ingredient bonded to inert material and formulated into small, irregularly shaped particles that are applied to plants in a dry form

3. Wettable powder — Dry chemical sold in dust form but when applied is mixed with water and constantly agitated to maintain a suspension

4. Soluble powder — Dry chemical sold in dust form that readily dissolves in water and is applied as a liquid

5. Bait — Dry chemical insecticide usually sold in granular or tablet form meant to be eaten by the crop pest

XXII. Types of pesticide applicators and their descriptions

A. Manually operated sprayers — Hand-operated sprayers used to treat small areas such as lawns, flower beds, and home gardens

EXAMPLES: Aerosol-can sprayers, hand-pump sprayers, trigger-pump sprayers, pump-up compressed-air sprayers, calibrated garden-hose sprayers

B. Power-driven sprayers — Sprayers driven by gasoline or diesel engines or by tractor power take-off (PTO) shafts; used for crop applications

(NOTE: Power-driven sprayers are usually mounted on wheels, trailers, or pickup truck beds.)

C. Conservative-use applicators — New types of spraying equipment used in crop applications to reduce the amount of pesticides required

EXAMPLES: Recovery sprayers, electrostatic sprayers, sponge-bar applicators

CONTROL CROP PESTS AND DISEASES
UNIT V

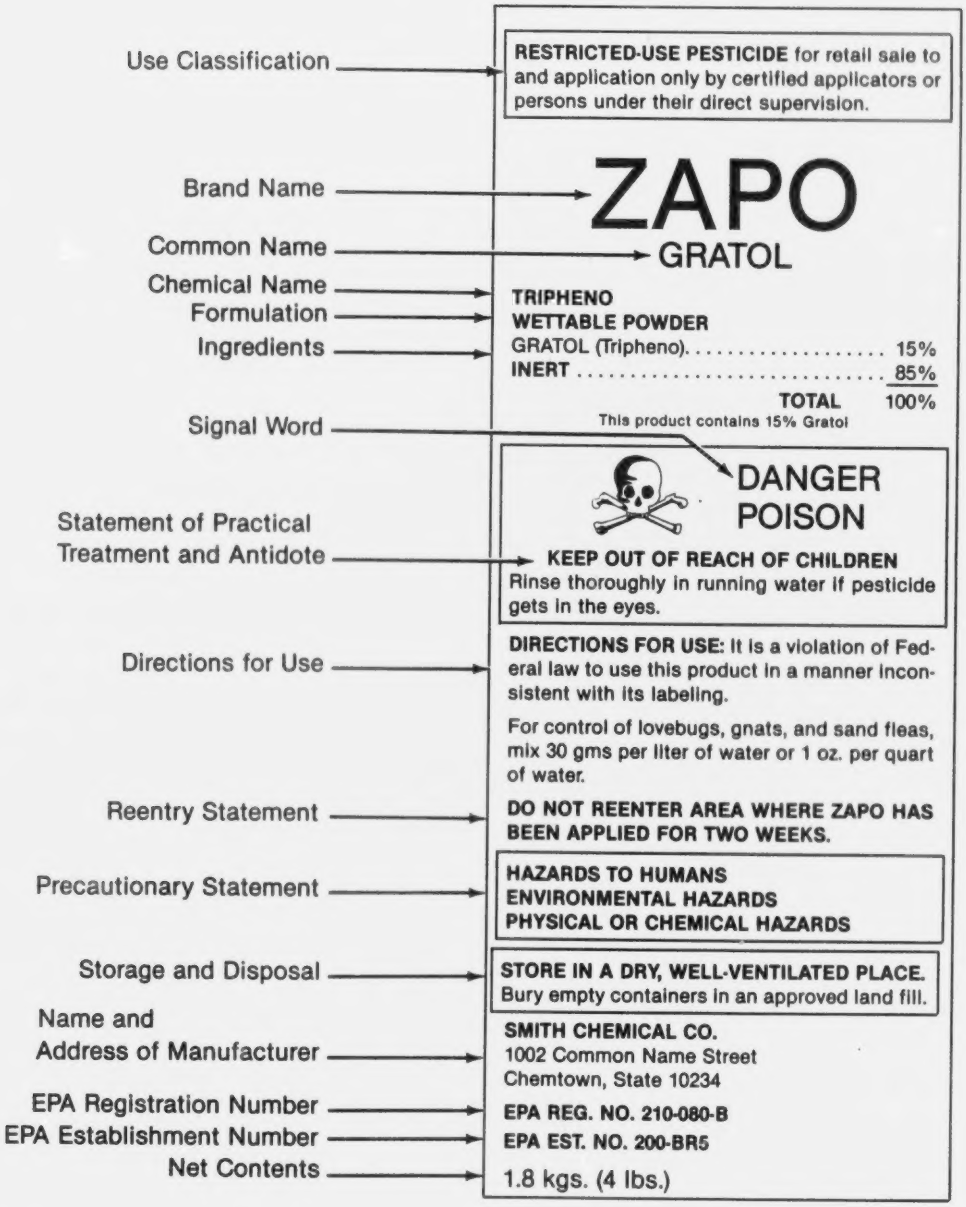
ASSIGNMENT SHEET #1 — INTERPRET PESTICIDE LABEL INFORMATION

NAME ______________________________ SCORE ______________

To be able to select the correct pesticide, you must be able to read and understand the directions on the pesticide container label. Label directions are required by law to be accurate and complete. The label is a legal document; therefore, you must follow its instructions or you may be subject to either civil or criminal penalties. Always read the label carefully before you buy the pesticide. If you have any questions, be sure to ask the pesticide dealer or supplier. Read the directions again before mixing and applying the pesticide, and read them again before storing or disposing of the pesticide. Following the label directions is the key to the safe and correct use of pesticides.

Study the sample label on the following page, which identifies the types of information found on pesticide labels. Then study the Prentox® label and answer the questions that follow it.

ASSIGNMENT SHEET #1



Use Classification	**RESTRICTED-USE PESTICIDE** for retail sale to and application only by certified applicators or persons under their direct supervision.
Brand Name	ZAPO
Common Name	GRATOL
Chemical Name	**TRIPHENO**
Formulation	**WETTABLE POWDER**
Ingredients	GRATOL (Tripheno) .... 15% **INERT** .... 85% **TOTAL** 100% This product contains 15% Gratol
Signal Word	DANGER POISON
Statement of Practical Treatment and Antidote	**KEEP OUT OF REACH OF CHILDREN** Rinse thoroughly in running water if pesticide gets in the eyes.
Directions for Use	**DIRECTIONS FOR USE:** It is a violation of Federal law to use this product in a manner inconsistent with its labeling. For control of lovebugs, gnats, and sand fleas, mix 30 gms per liter of water or 1 oz. per quart of water.
Reentry Statement	**DO NOT REENTER AREA WHERE ZAPO HAS BEEN APPLIED FOR TWO WEEKS.**
Precautionary Statement	**HAZARDS TO HUMANS** **ENVIRONMENTAL HAZARDS** **PHYSICAL OR CHEMICAL HAZARDS**
Storage and Disposal	**STORE IN A DRY, WELL-VENTILATED PLACE.** Bury empty containers in an approved land fill.
Name and Address of Manufacturer	**SMITH CHEMICAL CO.** 1002 Common Name Street Chemtown, State 10234
EPA Registration Number	**EPA REG. NO. 210-080-B**
EPA Establishment Number	**EPA EST. NO. 200-BR5**
Net Contents	1.8 kgs. (4 lbs.)

Used with permission of the American Association for Vocational Instructional Materials, from *Applying Pesticides*, by Thomas S. Colvin and J. Howard Turner, 1980.

ASSIGNMENT SHEET #1

prentox®

MALATHION 5 LB EMULSIFIABLE CONCENTRATE

ACTIVE INGREDIENTS:	
Malathion*	57.0%
Xylene Range Aromatic Solvent	34.0%
INERT INGREDIENTS:	9.0%
TOTAL	100.0%

***O-Dimethyl Dithiophosphate of Diethyl Mercaptosuccinate**

PRENTOX® — Registered Trademark of Prentiss Drug & Chemical Co., Inc.

KEEP OUT OF REACH OF CHILDREN

CAUTION

STATEMENT OF PRACTICAL TREATMENT

If swallowed — Do not induce vomiting. Call a physician immediately. **If inhaled** — Take person into fresh air. **If on skin** — Wash thoroughly with plenty of soap and water. **If in eyes** — Flush eyes with plenty of water. Get prompt medical attention.

EPA REG. NO. 655-323
E.P.A. EST. NO. 655-GA-1

prentiss
Drug & Chemical Co., Inc.

Plant: Kaolin Road Sandersville, GA. 31082
Office: C.B. 2000 Floral Park, N.Y. 11001

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION

Harmful if swallowed. Avoid breathing and avoid contact with skin, eyes or clothing. Wash thoroughly after handling. In case of contact, immediately flush eyes or skin with plenty of water. Get medical attention if irritation persists.

NOTE TO PHYSICIAN: Malathion causes cholinesterase inhibition. Atropine is antidotal.

Do not apply this product in such a manner as to directly or through drift expose workers or other persons. The area being treated must be vacated by unprotected persons.

ENVIRONMENTAL HAZARDS

This product is toxic to fish. Do not apply directly to water. Do not contaminate water by cleaning of equipment or disposal of wastes. This product is highly toxic to bees.

PHYSICAL & CHEMICAL HAZARDS

Do not use or store near heat or open flame.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

Do not enter treated area without protective clothing until sprays have dried.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal. Open dumping is prohibited.

STORAGE: If container is damaged: Stop any leaks by repositioning the container or by patching or otherwise repairing the leaks. Take care to avoid contact with pesticide and wear protective gear. On cleanup of spilled liquids, wear protective equipment as required to prevent contact with the product or its vapors. Cover the spilled areas with generous amounts of absorbent material, such as clay, diatomaceous earth, sand, or sawdust. Sweep the contaminated absorbent on to a shovel and put the sweepings into a salvage drum. Dispose of wastes as below. Place any leaking container into a similar drum or glass container. Do not store, use, pour, or spill near heat or open flame. Do not store in car trunk where temperatures may exceed 120°F.

PESTICIDE DISPOSAL: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Triple rinse (or equivalent). Puncture and dispose of in a sanitary landfill or incineration, or, if allowed by State and local authorities by burning. If burned, stay out of smoke.

Labeling is used with permission of Prentiss Drug and Chemical Co., Inc., Floral Park, New York. Labeling has been extracted from materials supplied by Prentiss and is not represented to be a complete and true copy of their label.

ASSIGNMENT SHEET #1

A. What is the brand name of this pesticide? ____________________

B. What is the product's common chemical name? ____________________

C. What type of formulation is this pesticide? ____________________

D. What are the chemical's active ingredients and what are their percentages?

1. ____________________ ____________________ %

2. ____________________ ____________________ %

E. What percentage of the chemical is inert ingredients? ____________________ %

F. Read the reentry statement. What reentry precautions should be obeyed?

____

____

G. Read the statement of practical treatment. What instructions should be followed if the product is swallowed?

____

____

H. What statement on the label should concern alfalfa producers if they depend on bees for pollinating their alfalfa crops?

____

____

I. How should you dispose of the empty container? ____________________

____

____

____

____

CONTROL CROP PESTS AND DISEASES
UNIT V

ASSIGNMENT SHEET #2 — CALCULATE PESTICIDE MIXTURE AND COST

NAME ______________________________ SCORE ______________

Pesticides are thoroughly tested and their applications rates are carefully determined before they are placed on the market, and in order to get the most benefit from the dollars you invest in a pesticide, it is critical that you be able to determine the proper amount of pesticide to apply to your crop. Using too much pesticide can sometimes harm the crop, and using too little pesticide may not control or kill the pest or disease—and if either of these happens, your dollars invested in the pesticide have been wasted.

The purpose of this assignment sheet is to give you practice in learning how to calculate pesticide mixtures and to determine the cost of applying a pesticide. Study the sample case study below, and then study the pesticide label on the following page and make the calculations you will need to answer the questions following the label.

Sample Case Study

Suppose you are preparing to spray for annual and biennial weeds in your 60-acre barley crop. The mixing directions on the herbicide you have chosen indicate that you should apply 1/2 to 2 pints of herbicide per acre and a minimum of 10 gallons of water must be mixed with the herbicide per acre for ground application.

You have chosen to use 1 pint of herbicide per acre mixed with the recommended minimum of 10 gallons of water per acre. The herbicide is available in 1-gallon containers priced at $13.60 each. Assume that your spray nozzles and pressure are set correctly and that you have a 100-gallon spray tank.

A. To find the number of acres that can be sprayed per tank—

Divide tank capacity by the number of gallons of water needed per acre, or

100 Gal Capacity ÷ 10 Gal per Acre = 10 Acres

B. To find the amount of pesticide needed per tank—

Multiply the number of acres that can be sprayed per tank times the amount of pesticide needed per acre, or

10 Acres × 1 Pint per Acre = 10 Pints (1 1/4 Gal)

C. To find the number of tanks of pesticide mixture needed—

Divide the number of acres to be sprayed by the number of acres that can be sprayed per tank, or

60 Acres ÷ 10 Acres = 6 Tanks

ASSIGNMENT SHEET #2

D. To find the total amount of pesticide needed—

Multiply the number of acres to be sprayed times the amount of pesticide needed per acre, or

1 Pint per Acre × 60 Acres = 60 Pints (7 ½ Gal)

E. To find the total cost of the pesticide—

Multiply the total amount of pesticide needed times the price per unit sold, or

8 Gal × $13.60 = $108.80

ASSIGNMENT SHEET #2

WEEDONE LV 4

TO PREPARE A SPRAY: Add one half the required amount of water to the spray tank, then add WEEDONE LV4 with agitation, and finally the balance of the water with continued agitation. This material forms an emulsion in water—not a solution. This tends to separate on standing. Provide agitation to prevent such separation and insure uniform spray mixtures. **NOTICE:** Use WEEDONE LV6 Broadleaf Postemergence Herbicide to make oil solutions for airplane spraying.

RECOMMENDATIONS FOR APPLYING WEEDONE LV4 Broadleaf Postemergence Herbicide

WEEDS IN CROPS

	AMOUNT OF WEEDONE LV4 Per Acre	**DIRECTIONS**
Wheat, Barley, Rye (not underseeded with legumes)		
Annual and biennial weeds	½-2 pints*	Apply after grain is fully tillered (about 4"-8" high) but not forming joints in the stem. Apply when weeds are near bud stage. *Do not spray in boot to dough stage.*
Perennial broadleaf weeds	1-2 pints*	
WEEDONE LV4 and ME4™ BROMINAL Tank Mixture on Wheat, Barley, Oat, and Rye.		ME4 BROMINAL Broadleaf Herbicide will control some annual weeds that are resistant to WEEDONE LV4 and may be tank mixed with WEEDONE LV4 for broader spectrum weed control on small grains.
Cereal areas except Washington, Oregon, Idaho	½-1 pint plus ½-¾ pint ME4 Brominal	TO PREPARE the spray, first mix WEEDONE LV4 in water then add the ME4 Brominal. Use the higher rates for larger weeds or where weed growth is slow due to dry or cold weather. Apply before weeds are 6 inches high. Use 10-20 gallons total spray volume per acre with ground equipment or use 5-10 gallons total spray volume with air application. Use higher volume on larger weeds. Observe all directions, precautions, and restrictions on both products labeling.
Washington, Oregon, Idaho	½-1 pint plus ¾-1 pint ME4 Brominal	
Wild onion or garlic	1 ½-2 pints	Apply 1 ½ pints when grain is fully tillered and wild garlic or onion plants are small. Apply 2 pints after harvest in the crop stubble.
Emergency Weed Control in Wheat Perennial broadleaf weeds	3 pints	Apply when weeds are approaching bud stage after the dough stage *but do not spray grain in the boot to dough stage.* The 3 pint per acre application can produce injury to wheat. Balance the severity of your weed problem against the possibility of crop damage. Where perennial weeds are scattered, spot treatment is suggested to minimize the extent of crop injury.
Preharvest	1-2 pints*	Apply when grains are in the hard dough stage to suppress large weeds that may interfere with harvest. Best results will be obtained when soil moisture is sufficient to induce succulent weed growth.

*Use the lower rate if small annual and biennual weeds are the major problem. Use the higher rate if perennial weeds or annual and biennial weeds are present which are in the hard-to-kill categories as determined by local experience. The higher rates increase the risk of grain injury and should be used only where the weed control problem justifies the grain damage risk. For aerial application on grain, apply WEEDONE LV4 in 2 to 5 gallons of water per acre. For ground application, use a minimum of 10 gallons of water per acre.
Do not mix with oil for crop uses.
Do not forage or graze treated fields for 2 weeks after application.
Do not feed treated straw to livestock.

Used with permission of Phenoxy Products, a division of Union Carbide Agricultural Products, Inc., Research Triangle Park, North Carolina.

ASSIGNMENT SHEET #2

Case Study

Suppose that your 80-acre wheat crop contains numerous perennial weeds that lower the quality of your crop. Emergency weed control is needed before harvesting the crop. You have a 100-gallon spray tank, and the price of the herbicide you decide to use to treat your crop with is $16.00 per gallon. Assume you can purchase the herbicide in 1-gallon containers. You must decide how much herbicide to apply per acre and how much water to use per acre. Using the mixing directions on the previous page, answer the following questions. Show your work.

A. How much herbicide should you apply per acre? ____________________

B. How much water should you use per acre? ____________________

C. How many acres can you spray with one tank of herbicide mixture?

____________________ acres

D. How much herbicide should be mixed in one tank of water?

____________________ pints or ____________________ gallons

ASSIGNMENT SHEET #2

E. How many tanks of mixture will be needed to spray the 80 acres?

_____________________ tanks

F. How much herbicide will be needed to treat the wheat crop?

_____________________ pints or _____________________ gallons

G. What will be the total price of the herbicide needed?

$ _____________________

CONTROL CROP PESTS AND DISEASES
UNIT V

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

A. Prentox

B. Malathion

C. Emulsifiable concentrate

D. 1. Malathion 57.0%
   2. Xylene range aromatic solvent 34.0%

E. 9%

F. Do not enter treated area without protective clothing until sprays have dried.

G. Do not induce vomiting. Call a physician immediately.

H. This product is highly toxic to bees.

I. Triple rinse (or equivalent). Puncture and dispose of in a sanitary landfill or incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

Assignment Sheet #2 — Evaluated to the satisfaction of the instructor

(NOTE: Below are suggested answers for Assignment Sheet #2 that are correct if the problem is worked following the assumption that 1 pint of herbicide per acre is used.)

A. 1 pint

B. 10 gallons

C. 100 Gal Capacity ÷ 10 Gal per Acre = *10 Acres*

D. 10 Acres × 1 Pint per Acre = *10 Pints*

   10 Pints ÷ 8 Pints/Gal = *1 1/4 Gallons*

E. 80 Acres ÷ 10 Acres per Tank = *8 Tanks*

F. 1 Pint per Acre × 80 Acres = *80 Pints*

   80 Pints ÷ 8 Pints/Gal = *10 Gallons*

G. 10 Gal × $16 = *$160*

CONTROL CROP PESTS AND DISEASES
UNIT V

TEST

NAME ______________________________ SCORE ______________

1. State the definition of *integrated pest management (IPM).*

____

____

____

____

2. State the goals of integrated pest management.

a. ____

b. ____

c. ____

3. List major factors affecting crop production.

a. ____

b. ____

c. ____

4. Match major pest-control practices to their correct descriptions. Write the correct numbers in the blanks.

_____a. Using living organisms to control a crop pest

_____b. Using man-made compounds to control a crop pest

_____c. Using plant breeding practices that result in controlling a crop pest

_____d. Using mechanical practices initiated by humans to alter or in some way adversely affect a crop pest

1. Cultural practice
2. Biological practice
3. Genetic practice
4. Chemical practice

TEST

5. Match to their correct definitions terms associated with crop pests and diseases. Write the correct numbers in the blanks.

_____a. Agent that affects the entire organism it controls by spreading from point of entrance throughout organism's system

_____b. Pesticide used to destroy plants, especially weeds, or to check their growth

_____c. Pesticide used to kill insects

_____d. Any chemical used for killing insects, weeds, or diseases

_____e. Agent that kills or affects pest when pest comes in contact with it

_____f. Pesticide used to kill fungi

1. Insecticide
2. Herbicide
3. Systemic pesticide
4. Contact pesticide
5. Pesticide
6. Fungicide

6. State four ways weeds hinder crop production.

a. ____

b. ____

c. ____

d. ____

7. List four ways weeds are spread.

a. ____

b. ____

c. ____

d. ____

8. Select from the following list methods of controlling weeds. Write an "X" in the blank before each correct answer.

_____a. Practicing crop rotation

_____b. Practicing conventional soil cultivation

TEST

_____c. Planting one crop year after year

_____d. Harvesting developed weed seed pods

_____e. Practicing flame cultivation

_____f. Applying herbicides

_____g. Creating crop competition

_____h. Avoiding pasturing animals

9. Match classifications of herbicides to their correct descriptions. Write the correct numbers in the blanks.

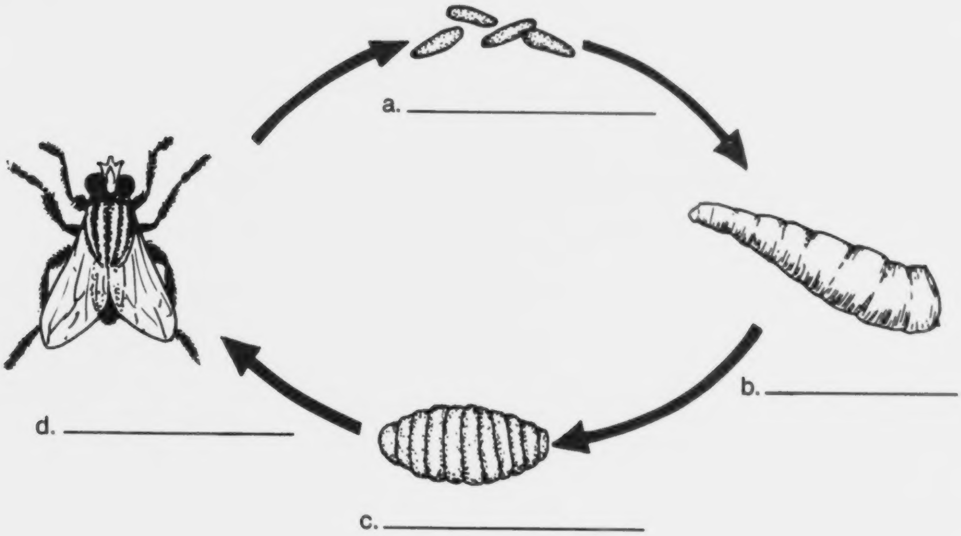
_____a. Herbicide that moves within a plant from a point of entry and affects the entire plant

_____b. Agent that prevents any plant growth in the soil

_____c. Herbicide that kills only the parts of the plant that it covers

1. Contact herbicide
2. Translocated herbicide (systemic herbicide)
3. Soil sterilant

10. Label the life-cycle stages of most insects.



TEST

11. State four methods of controlling insects.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

12. Match classifications of insecticides to their correct descriptions. Write the correct numbers in the blanks.

_____a. Insecticide that kills by penetrating insect's body either directly or by entering its breathing or sensory pores; used to control piercing or sucking insects

_____b. Insecticide that prevents insect reproduction through sterilization of the insect

_____c. Insecticide that kills when treated plant material reaches the insect's stomach; used to control chewing insects

1. Sterilizing agent
2. Contact poison
3. Stomach poison

13. Select from the following list indications of plant diseases. Write an "X" in the blank before each correct answer.

_____a. Changes in color

_____b. Death of plant tissue

_____c. Rapid growth

_____d. Dropping leaves, blossoms, and fruits

_____e. Wilting

_____f. Abundant fruit

_____g. Rots

_____h. Seepage

_____i. Malformations

_____j. Galls

TEST

14. Match causes of infectious plant diseases to their correct descriptions. Write the correct numbers in the blanks.

_____a. Microscopic, single-celled plants that are borne inside seed or enter a plant through natural openings or injured tissue

_____b. Plants that obtain their food from crop plants

_____c. Slender, microscopic eelworms that usually live in the soil, but will attack small plant roots and kill the plant by feeding on its cells and by secreting toxic saliva

_____d. Living plants that lack chlorophyll and must obtain their food from other living plants or decaying organic matter

_____e. Submicroscopic infectious entities that multiply only inside living host cells

1. Fungi
2. Viruses
3. Nematodes
4. Bacteria
5. Parasitic seed plants

15. Discuss methods of controlling plant diseases.

16. Discuss factors to consider before using agricultural chemicals on crops.

TEST

17. Discuss factors to consider when selecting and obtaining chemicals.

____

____

____

____

____

18. List personal protective devices used when handling pesticides.

a. ____

b. ____

c. ____

d. ____

e. ____

f. ____

19. State treatments for types of pesticide exposure.

a. Pesticide in the eyes—______________________________

____

____

b. Pesticide on the skin—______________________________

____

____

c. Pesticide swallowed—______________________________

____

____

TEST

d. Pesticide inhaled—____

____

____

20. Select from the following list factors to consider in storing and disposing of chemicals. Write an "X" in the blank before each correct answer.

_____a. Store chemicals in convenient area where other items such as feed and seed are stored

_____b. Store chemicals in a fire-resistant cabinet

_____c. Do not store or transport chemicals with food, feed, seed, or animals

_____d. Keep chemical-storage area unlocked and readily accessible

_____e. Identify a chemical-storage area with a sign stating that dangerous chemicals are stored there

_____f. Read the chemical's label for specific storage directions

_____g. Store chemicals in their original containers with labels left intact

21. Match types of pesticide formulations to their correct definitions. Write the correct numbers in the blanks.

Liquid formulations

_____a. Liquid chemical that is placed under pressure and applied as a gas

_____b. Liquid chemical that is placed under pressure and applied as a fog or mist

_____c. Concentrated liquid chemical that when applied is mixed with water and is constantly agitated to maintain a suspension

_____d. Liquid chemical that is ready to be used as purchased and is not mixed with water

_____e. Paste-like yet pourable chemical that when applied is mixed with water and is constantly agitated to maintain a suspension

1. Emulsifiable concentrate
2. Solution
3. Flowable
4. Fumigant
5. Aerosol

TEST

Dry formulations

______a. Dry chemical sold in dust form but when applied is mixed with water and constantly agitated to maintain a suspension

______b. Dry chemical ingredient bonded to inert material and formulated into small, irregularly shaped particles that are applied to plants in a dry form

______c. Dry chemical ingredient added to a fine powder that is applied directly to plants in its dry form

______d. Dry chemical insecticide usually sold in granular or tablet form meant to be eaten by the crop pest

______e. Dry chemical sold in dust form that readily dissolves in water and is applied as a liquid

1. Dust
2. Granule
3. Wettable powder
4. Soluble powder
5. Bait

22. Match types of pesticide applicators to their correct descriptions. Write the correct numbers in the blanks.

______a. Sprayers driven by gasoline or diesel engines or by tractor power take-off (PTO) shafts; used for crop applications

______b. Hand-operated sprayers used to treat small areas such as lawns, flower beds, and home gardens

______c. New types of spraying equipment used in crop applications to reduce the amount of pesticides required

1. Manually operated sprayers
2. Power-driven sprayers
3. Conservative-use applicators

(NOTE: Test items 23 and 24 list the assignment sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

23. Interpret pesticide label information.

24. Calculate pesticide mixture and cost.

CONTROL CROP PESTS AND DISEASES
UNIT V

ANSWERS TO TEST

1. Program combining biological-, cultural-, genetic-, and chemical-control methods to hold pest numbers or their damage below economically important levels

2. a. To improve pest control
   b. To make crop protection more economical
   c. To protect the environment

3. a. Weeds
   b. Insects
   c. Diseases

4. a. 2
   b. 4
   c. 3
   d. 1

5. a. 3
   b. 2
   c. 1
   d. 5
   e. 4
   f. 6

6. Answer should include any four of the following

   a. Compete with crop for moisture
   b. Compete with crop for sunlight
   c. Compete with crop for soil nutrients
   d. Harbor insects and diseases
   e. Promote molding and spoilage in stored grains
   f. Reduce crop yield
   g. Reduce crop quality
   h. Reduce crop value

7. Answer should include any four of the following

   a. Vegetative reproduction of seed, roots, stems, leaves, or bulbs
   b. Wind
   c. Water
   d. Humans
   e. Animals
   f. Equipment

ANSWERS TO TEST

8. a, b, e, f, g

9.
   a. 2
   b. 3
   c. 1

10.
   a. Eggs
   b. Larva (maggot)
   c. Pupa
   d. Adult

11. Answer should include any four of the following

   a. Practicing timely cultivation
   b. Practicing crop rotation
   c. Using pasturing techniques
   d. Planting insect-resistant crops
   e. Introducing organisms that feed on pest insects
   f. Using insecticides

12.
   a. 2
   b. 1
   c. 3

13. a, b, d, e, g, h, i, j

14.
   a. 4
   b. 5
   c. 3
   d. 1
   e. 2

15. Discussion should include the following

   a. Planting disease-resistant plant varieties
   b. Planting at times when disease is ineffective, rare, or absent
   c. Planting in an area where disease is ineffective, rare, or absent
   d. Preventing the introduction or establishment of disease within a disease-free area
   e. Eliminating disease from a region or from an individual plant variety in which disease is established
   f. Using chemical pesticides to protect plants from disease
   g. Using chemical or nutritional treatments to reduce the severity of disease in infected plants

ANSWERS TO TEST

16. Discussion should include the following

    a. Chemical use is a quick and sure means of controlling pests and diseases
    b. Chemical use can replace some tillage operations
    c. Chemical use is expensive and may reduce the crop producer's margin of profit
    d. Repeated chemical use can make disease organisms become resistant to chemicals
    e. Chemical use may damage or endanger the environment and may be toxic to the applicator

17. Discussion should include the following

    a. Identify the pest you intend to control
    b. Know your means and limits for applying a chemical
    c. Prepare the information you will need to determine the quantity of chemical you will need
    d. Consult a reputable chemical dealer or supplier
    e. Determine whether selected pesticide is for restricted or general use

18. a. Coveralls or long-sleeved shirt and long pants
    b. Raincoat or liquid-proof apron
    c. Boots made of unlined neoprene
    d. Long gloves made of unlined neoprene
    e. Goggles or face shield
    f. Respirator

19. a. Immediately flush eyes with low-pressure running water for at least fifteen minutes; call a physician
    b. Remove contaminated clothing, including shoes; wash skin and hair with detergent and plenty of water; call a physician
    c. Check pesticide label to see if vomiting should be induced; take care that person does not strangle; get medical help as quickly as possible
    d. Move patient to fresh air and have him or her lie down; loosen patient's clothing; keep patient warm and quiet; apply artificial respiration if breathing stops; get medical help as quickly as possible

20. b, c, e, f, g

21. **Liquid formulations**

    a. 4
    b. 5
    c. 1
    d. 2
    e. 3

ANSWERS TO TEST

Dry formulations

a. 3
b. 2
c. 1
d. 5
e. 4

22. a. 2
    b. 1
    c. 3

23. Evaluated to the satisfaction of the instructor

24. Evaluated to the satisfaction of the instructor

INTERPRET NUTRITIONAL INFORMATION
UNIT I

UNIT OBJECTIVE

After completing this unit, the student should be able to interpret nutritional information using tables associated with the net-energy system of ration evaluation. The student will show this ability by completing an assignment sheet and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with animal digestion and interpreting nutritional information.
2. Discuss reasons for studying the digestive processes of animals.
3. Match categories of feed to their correct definitions.
4. Match major classes of animal digestive systems to their correct definitions.
5. Identify the major parts of the digestive system of ruminants.
6. Arrange in order the major steps in the digestive process of ruminants.
7. Match subdivisions of the nonruminant class to their correct definitions.
8. Identify the major parts of the digestive systems of nonruminants.
9. Arrange in order the major steps in the digestive processes of nonruminants.
10. Discuss factors measured in determining ration formulations.
11. Match nutrients to their basic functions.
12. State sources for the types of protein found in ration formulations.
13. Match to their correct definitions systems used in evaluating ration formulations.
14. Discuss factors to consider when deciding which system to use to evaluate ration formulations.
15. State the basic theories that govern the net-energy system.
16. State resources needed when applying the net-energy system to livestock feeding.

OBJECTIVE SHEET

17. Match abbreviations used in the net-energy system to their correct definitions.

18. State the extent to which primary energy-level considerations have been determined by species.

19. Interpret nutritional information from tables.

INTERPRET NUTRITIONAL INFORMATION
UNIT I

SUGGESTED ACTIVITIES

I. Unit contents

  A. Objective sheet

  B. Suggested activities

    1. Supplements

      a. Supplement #1 — Protein Considerations in Swine Rations

      b. Supplement #2 — Guidelines for Feeding Swine

      c. Supplement #3 — Guidelines for Feeding Sheep

      d. Supplement #4 — Guidelines for Feeding Horses

    2. Transparency masters

      a. TM #1 — Major Parts of the Digestive System of Ruminants

      b. TM #2 — Major Parts of the Digestive Systems of Nonruminants

      c. TM #3 — Major Parts of the Digestive Systems of Nonruminants (Continued)

      d. TM #4 — Major Parts of the Digestive Systems of Nonruminants (Continued)

      e. TM #5 — Utilization of Energy in the Net-Energy System

  C. Information sheet

  D. Assignment sheets

    1. Assignment Sheet #1 — Interpret Nutritional Information from Tables

    2. Assignment Sheet #2 — Use the Trial-and-Error Method to Balance a Ration and Use the Net-Energy System to Predict Gain

  E. Answers to assignment sheets

  F. Test

  G. Answers to test

SUGGESTED ACTIVITIES

II. Instructor's guide

A. Review unit and plan presentation.

B. Obtain materials to supplement unit.

(NOTE: The film and ½-inch VHS videotapes below are available to Oklahoma teachers on a free-loan basis. Oklahoma teachers may order from the Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

1. Film — *Remarkable Ruminants*. Color, 23 minutes, 1974. Available from Modern Talking Picture Service, 5000 Park Street, North Petersburg, Illinois 60062, phone 800-323-5343.

   (NOTE: This film discusses the research efforts of universities and private industry as they develop new, nutritionally balanced diets for ruminants.)

2. Videotapes

   a. *Beef Cow Nutrition*

   b. *Supplementing Beef Cattle*

3. Feed tags; available from your local feed supplier

4. Feed samples; available from your local feed supplier

   (NOTE: Put feed samples in plastic bags and mount on a display board; label. Labels should contain nutritional information about the sample, such as percentage of crude fiber, percentage of crude protein, etc.)

5. Oklahoma State University Extension fact sheets that pertain to this unit; available through local extension offices in Oklahoma

   (NOTE: Examples of fact sheets that would pertain to this unit are listed below.)

   No. 3009 Nutrient Requirements of the Beef Cow Herd
   No. 3018 Average Composition of Common Feeds (Dry-Matter Basis)
   No. 3500 Swine Nutrition
   No. 3501 Formulating Swine Rations
   No. 3502 Feedstuff Composition for Swine Rations
   No. 3503 Relative Value of Grains for Market Hogs
   No. 3853 Managing the Lamb Feed Supply
   No. 3854 Feeding and Managing Lambs from Birth to Market
   No. 3971 Forage Alternatives for Horses

SUGGESTED ACTIVITIES

No. 3997 Ration Formulation for Horses
No. 4003 Formulating Rations for Diary Cows
No. 4010 Rations for the Dairy Herd
Great Plains Beef-Cattle Feeding Handbook
GPE-1001 Net-Energy Requirements of Feedlot Cattle
Pork Industry Handbook
PIH-3 Energy for Swine
PIH-5 Protein and Amino Acids for Swine
PIH-7 Principles of Balancing a Ration
PIH-23 Swine Rations

6. Microcomputer programs related to ration formulation

   (NOTE: A number of microcomputer programs related to ration formulation are available from the Agricultural Economics and Animal Science departments of Oklahoma State University.)

7. Copies of supplements as needed

8. Transparencies and competency profiles

   (NOTE: Transparencies and competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Introduce unit.

SUGGESTION:

- Explain to students that we take for granted the convenience of going to a local feedstore to purchase a sack of feed that has been scientifically balanced for the particular type of animal we want to feed. Then show students the display of labeled feed samples you have prepared, comparing the labels for such things as the percentage of crude protein and crude fiber found in the feed per pound.

  Then explain to students that with knowledge of the digestive system of their animals and of the systems used to evaluate rations, they too can scientifically balance rations. And, balancing your own rations will often be more economical than buying commercially balanced rations.

D. Provide students with unit.

E. Discuss unit and specific objectives.

F. Discuss information and assignment sheets.

SUGGESTED ACTIVITIES

1. Use Information Sheet, Section I to discuss terms and definitions associated with animal digestion and interpreting nutritional information.

   SUGGESTION:

   - Allow students to discuss terms and ask questions related to the terms.

2. Use Information Sheet, Section II to discuss reasons for studying the digestive processes of animals.

   SUGGESTIONS:

   - Explain to students that the type of digestive system an animal has determines the category of feed it is best able to utilize and that knowing which feed an animal is able to utilize leads to more efficient livestock feeding at less cost.

   - Discuss feed-conversion ratios, giving concrete examples illustrating the cost factor in livestock feeding. For example, work a problem on the board showing what 3 pounds of feed will cost to produce a pound of gain, and determine whether or not the cost of the feed is more or less than the animal will bring per pound at the market.

3. Use Information Sheet, Sections III and IV to discuss the categories of feed and the major classes of animal digestive systems.

   SUGGESTIONS:

   - Lead students to make the connection that, because of their digestive system, ruminants are best suited to eating large amounts of roughages (feeds high in fiber and low in energy) and that nonruminants are best suited to eating concentrates (feeds high in energy and low in fiber).

   - Explain that supplements are proteins, minerals, vitamins, antibiotics, etc., added to any basic feed to improve its nutritional value. But point out that students should keep in mind that supplements often increase the cost of the feed.

   - Have students to help you list examples of common farm animals that are ruminants (sheep, goats, cattle) and nonruminants (pigs, dogs, horses, rabbits, chickens, turkeys). Write the animals they name on the board, and then list and categorize the types of feed these animals should be fed.

4. Use Information Sheet, Sections V through IX to go into a more in-depth discussion of the digestive systems of ruminants and nonruminants; include the major parts of their digestive systems and the major steps in their digestive processes.

SUGGESTED ACTIVITIES

SUGGESTIONS:

- Show the film *Remarkable Ruminants* and Transparency #1 to illustrate your discussion of the ruminant system. Or, take students on a field trip to a slaughterhouse where you could view a digestive tract that has been removed from an animal.
- Use Transparencies #2 through #4 to illustrate your discussion of the three types of nonruminant systems.
- When discussing the differences between the nonfunctional-cecum system (pig) and the functional-cecum system (horse), point out the size of the cecum in the respective animals in comparison to the size of their other digestive organs. The horse's cecum is very large, enabling the horse to digest more roughages than other nonruminant animals.
- Point out that the digestive system of the avian (chicken) is very unique as compared to other traditional farm animals—it has some very specialized organs (crop, gizzard) that other nonruminants do not have. Dissect a chicken and point out these unique organs, and then open these organs so that students can see what may be found inside.

5. Use Information Sheet, Sections X through XII to discuss the major factors measured in determining ration formulations, nutrients and their basic functions, and the sources of protein found in ration formulations.

SUGGESTIONS:

- Point out that all nutrients are important to an animal because each has a specific function in the animal's body. If a ration is deficient in any nutrient, problems may occur, resulting in loss of production and loss of profit.
- Invite a feed dealer to discuss ration formulations, nutrients, and sources of protein.
- Display feed tags showing the percentages of nutrients found in all types of feeds.
- Display Oklahoma State University Extension fact sheets and allow students to read and report on any that are applicable to their livestock-feeding enterprises.
- Discuss each nutrient and its function as listed in the information sheet, and you may want to list each nutrient on the board and discuss functions in-depth, using the following information.

  Water — Helps flush impurities from the body; softens feces; makes up blood, saliva, and digestive juices; provides a coolant for the body (sweat)

SUGGESTED ACTIVITIES

Carbohydrates — Provide two essential sugars—lactose and glucose; supply heat and energy for warmth in cold weather

Fats — Supply heat and energy for warmth in cold weather; act as an insulator; add flavor and tenderness to meat

Minerals and vitamins — Act as a catalyst for proper body functions; maintain good health

(NOTE: Even though vitamins and minerals are called *micronutrients*, a deficiency in any one can create a drastic impact upon an animal's health or production.)

Protein — Helps maintain water balance; is included in the make-up of fluids including secretions, enzymes, hormones, and milk; helps form antibodies to fight off infection; combines with iron to form hemoglobin in the blood; is the major nutrient in the make-up of hair, hooves, and horns

- Point out that cost is an important factor to consider when determining the source of protein to be used in a ration. Explain that while animal-protein sources are generally regarded as being higher in quality than most plant proteins, animal proteins are not used as often because they are usually more expensive. Explain that in feeding situations where there is a narrow profit margin, such as in large feedlot operations, cost is carefully watched through the use of *least-cost ration* microcomputer programs. These computerized programs calibrate the ration that will meet the animal's needs at the lowest cost.
- Refer to Supplement #1 and discuss protein and amino acids as related to swine feeding.
- Show the videotapes *Beef Cow Nutrition* and *Supplementing Beef Cattle.*

6. Use Information Sheet, Sections XIII and XIV to discuss systems used in evaluating ration formulations and factors to consider when deciding which system to use to evaluate rations.

SUGGESTIONS:

- Explain the differences in the systems as presented in the information sheet, and then point out to students that although the TDN system has been used for many years, it is being replaced by the more accurate net-energy system. Therefore, it is important for students to learn the net-energy system, especially for cattle operations.
- Use Transparency #5 to discuss the net-energy system.
- Explain that research on the net-energy system is not complete as yet, but that Table 1 in the information sheet explains which information is available by species.

SUGGESTED ACTIVITIES

7. Use Information Sheet, Section XV to discuss the basic theories that govern the net-energy system.

   SUGGESTIONS:

   - Discuss the examples given under Parts A and B in the information sheet to illustrate the basic theories behind the system.
   - Present additional examples to illustrate the theories by using animals that the students may be more familiar with, pulling additional figures from Supplements #2 through #4.
   - Explain to students that the theories behind the net-energy system are much like dieting in humans in that the net-energy system is also based on the calorie system. You only require a certain amount of calories per day to maintain your weight, if you consume more than that amount, you gain weight; if you consume less than that amount, you lose weight.

8. Use Information Sheet, Sections XVI and XVII to discuss the resources needed when applying the net-energy system and the abbreviations used in the system.

   SUGGESTIONS:

   - Discuss the two types of tables needed to apply the net-energy system, using the tables in the information sheet or other tables you may wish to supply.
   - Point out that in order to fully understand the tables they will be using, students must know the abbreviations used in the net-energy system.

9. Use Information Sheet, Section XVIII to reinforce the extent to which the primary energy-level considerations have been determined by species.

   SUGGESTION:

   - Point out how these differences may affect the extent to which your students are able to use the net-energy system in their particular livestock operations.

10. Discuss the procedures in Assignment Sheet #1.

    SUGGESTIONS:

    - Prepare students for completing Part I of the assignment by drilling them in reading the tables in the assignment sheet. Ask them to locate certain information and then give the correct answer to the class.
    - Have students complete Part I.

SUGGESTED ACTIVITIES

- Read with students the introduction to Part II of the assignment sheet, and help them understand the calculations in the example problem. Then discuss the chart they must fill in in Section A of the assignment, and guide them as they complete the chart.

- Briefly discuss the problem that students are presented with in Section B of Part II, and then let students complete this chart on their own. Discuss their answers in class when the assignment has been completed.

11. Discuss the procedures in Assignment Sheet #2, carefully guiding the students through the example problem, and then have students complete the assignment sheet.

G. Give test.

H. Critique test and discuss in class.

I. Reteach and retest as necessary.

J. Complete appropriate section of competency profiles.

III. Unit references

A. Cullison, Arthur E. *Feeds and Feeding*. Reston, Virginia: Reston Publishing Company, Inc., 1979.

B. Gillespie, James R. *Modern Livestock and Poultry Production*, 2nd ed. New York: Delmar Publishers, Inc., 1983.

SUGGESTED ACTIVITIES

SUPPLEMENT #1 — PROTEIN CONSIDERATIONS IN SWINE RATIONS

When evaluating an animal's ration, it is a fairly common practice to select a ration with a high percentage of protein. *Percent of protein* is a term describing the quantity of protein in a ration. While the quantity of protein in a ration may be the main factor to look at when evaluating a ration for many animals, it should not be the only factor looked at when evaluating a ration for swine. In swine feeding, the quantity of protein in a ration is often not as important as the amino-acid balance of the protein in a ration.

Amino acids are the nitrogen compounds that make up protein. They supply the building materials for body tissues and many of the body regulators, making them critical to the growing pig. While the animal's body can manufacture some of these needed amino acids, others must be supplied in the feed the animal eats. The amino acids that the body of the animal cannot manufacture are called the *essential amino acids*, which include arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, trypotophan, and valine. Therefore, when feeding swine, be sure that the ration includes a good balance of these essential amino acids as well as a proper percentage of protein.

SUGGESTED ACTIVITIES

SUPPLEMENT #2 — GUIDELINES FOR FEEDING SWINE

Animal description	% Crude protein*	Amount per day
Sows and gilts, flushing two to three weeks prior to breeding	14%	6 lb to 8 lb
Bred sows and gilts	14%	4 lb to 6 lb
Sows nursing litters	14% to 15%	10 lb to 15 lb
Nursing pigs, two weeks old to weaning	16% to 18% creep ration	Free choice
Pigs, 50 lb to 100 lb	16%	6% of body weight
Pigs, 100 lb to 170 lb	14%	5% of body weight
Pigs, 170 lb to 220 lb, or market weight	13%	4% of body weight
Boars, maintenance	14%	4 lb to 6 lb
Boars, breeding season	16%	6 lb to 8 lb

*Make sure that swine rations contain high-quality protein—a proper balance of amino acids.

SUGGESTED ACTIVITIES

SUPPLEMENT #3 — GUIDELINES FOR FEEDING SHEEP (DRY-LOT FEEDING)

Animal description	Hay description and amount per day	Concentrate ration amount per day and % of crude protein (CP)
Ewes, maintenance, 130 lb to 150 lb	3 lb alfalfa/grass mixed	—
Ewes, flushing, 2 to 3 weeks prior to breeding, 130 lb to 150 lb	3 lb alfalfa/grass mixed	½ lb to ¾ lb of 12% CP
Ewes, first fifteen weeks of gestation, 130 lb to 150 lb	3.5 lb alfalfa/grass mixed	—
Ewes, last six weeks of gestation, 130 lb to 150 lb	4 lb alfalfa/grass mixed	½ lb of 12% CP
Ewes, first eight weeks of lactation	4.5 lb alfalfa/grass mixed	2 lb of 12% CP
Lambs, birth to eight weeks	—	Free choice, 15% CP
Lambs, eight weeks to 75 lb	—	Free choice, 16% to 18% CP
Lambs, 75 lb to 120 lb, market weight	—	3 lb to 4 lb of 13% to 15% CP
Rams on maintenance	5 lb alfalfa/grass mixed	—
Rams, breeding season	5 lb alfalfa/grass mixed	2 lb of 12% CP

SUGGESTED ACTIVITIES

SUPPLEMENT #4 — GUIDELINES FOR FEEDING HORSES (DRY-LOT OR STALL FEEDING)

Animal description		Prairie hay	Alfalfa hay	Concentrate
Age, sex, and use	Weight (lb)	(lb per day)	(lb per day)	(lb per day)
Mature horse, idle	1100	11	—	6 lb of ration No. 1*
Mature horse, moderate work	1100	8	—	11 lb of ration No. 1*
Pregnant mare, last 1/3 of pregnancy	1100	8	—	10 lb of ration No. 1*
Lactating mare	1100	—	8	15 lb of ration No. 1*
Weanling	350 to 500	—	4 to 8	9.5 lb of ration No. 2**
Yearling	450 to 700	5	—	10.5 lb of ration No. 3***

***Ration No. 1 (12.2% Crude Protein)**

Ingredient	Lb per ton
Oats	1320
Cracked corn	570
Supplement	80
Limestone	20
Salt	10
Vitamin A	3,000,000 IU/ton

****Ration No. 2 (17.5% Crude Protein)**

Ingredient	Lb per ton
Oats	900
Cracked corn	600
Supplement	500

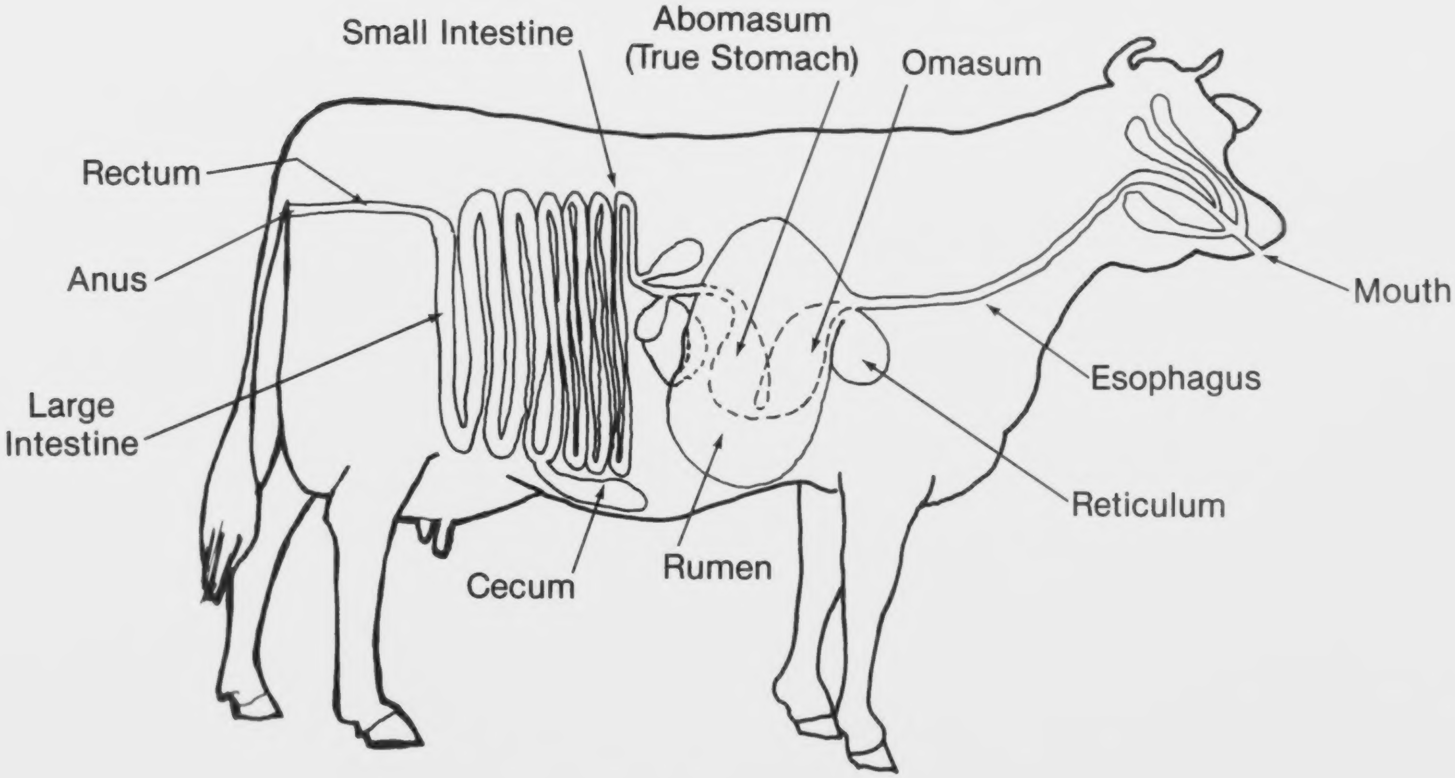
*****Ration No. 3 (14.6% Crude Protein)**

Ingredient	Lb per ton
Oats	1040
Cracked corn	780
Supplement	270
Limestone	10
Vitamin A	3,000,000 IU/ton

(NOTE: The supplement in these rations consists of crude protein, 30% to 40%; calcium, 2% to 4%; phosphorus, 1% to 2%; vitamin A, 10,000 IU/lb ; vitamin D, 2000 IU/lb.)

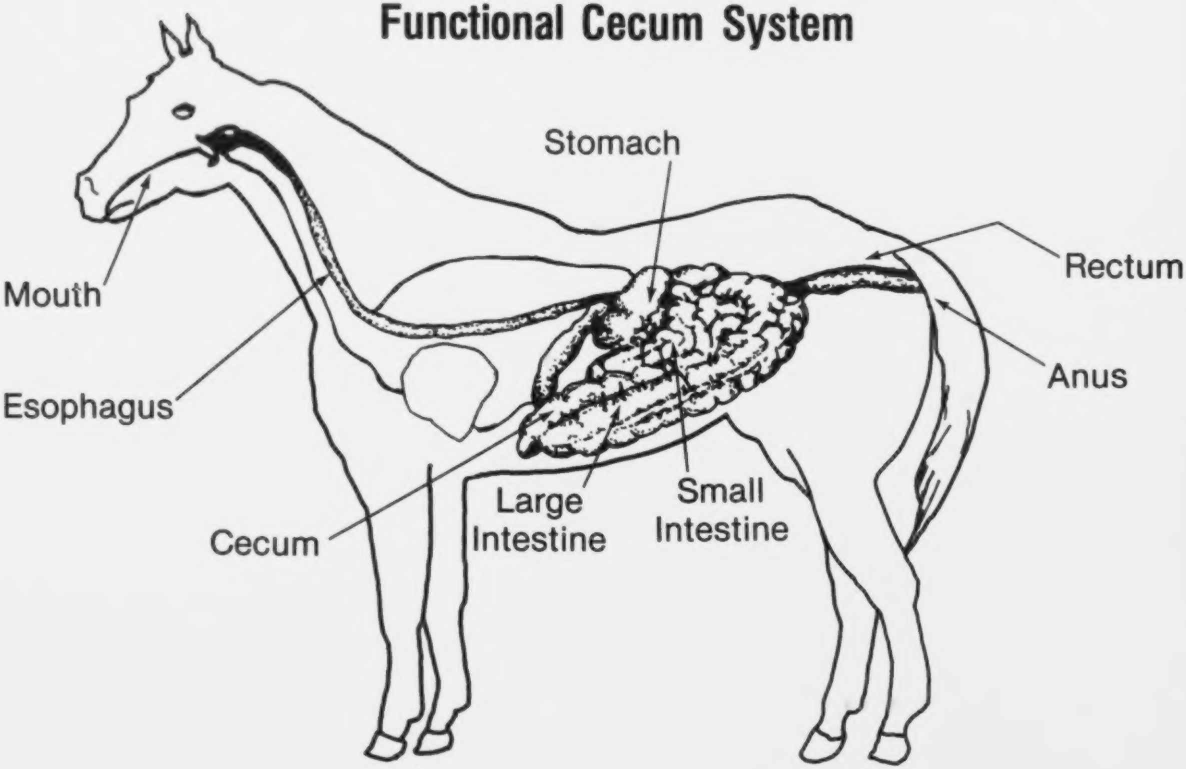
Adapted with permission of David W. Freeman, extension equine specialist, Cooperative Extension Service, Agriculture Division, Oklahoma State University, from "Nutritional Management Considerations for Horses," *An Sci Facts for Oklahoma Extension Workers*, March-April, 1984.

Major Parts of the Digestive System of Ruminants


Small Intestine
Abomasum (True Stomach)
Omasum
Rectum
Anus
Large Intestine
Mouth
Esophagus
Reticulum
Cecum
Rumen

Major Parts of the Digestive Systems of Nonruminants

Functional Cecum System

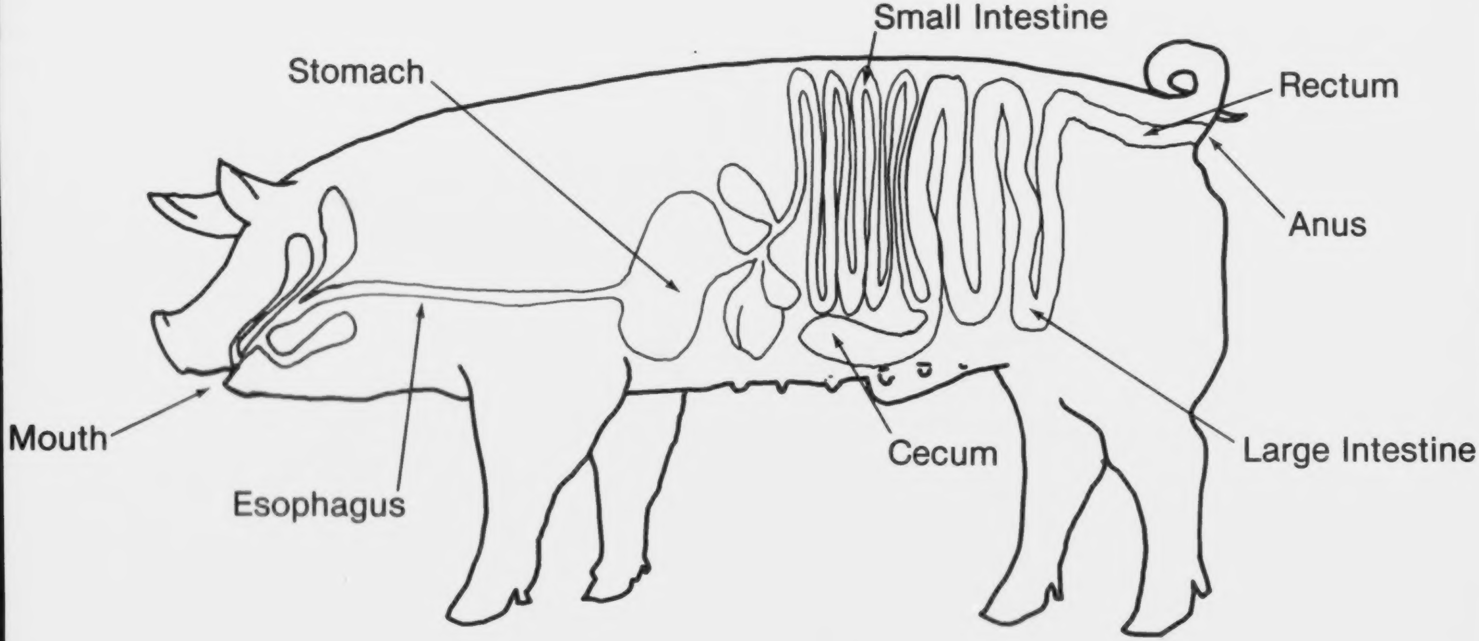

Stomach
Rectum
Mouth
Anus
Esophagus
Cecum
Large Intestine
Small Intestine

TM #2

Major Parts of the Digestive Systems of Nonruminants

(Continued)

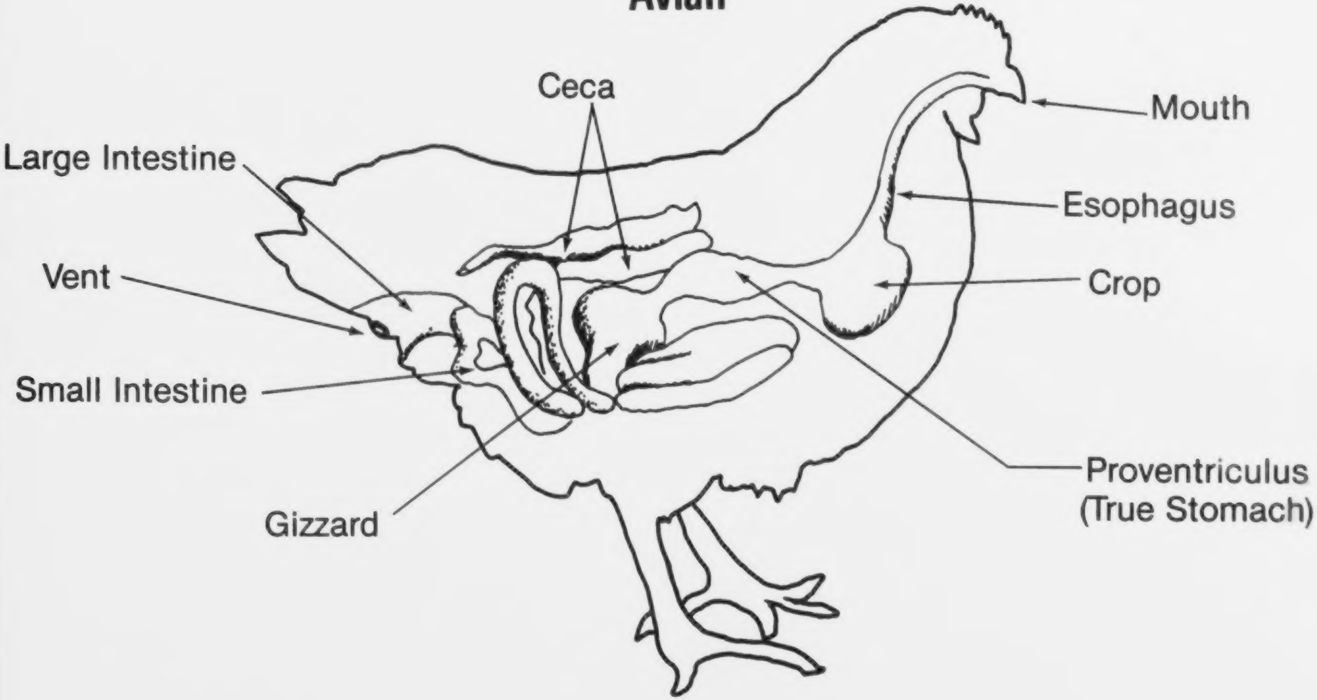
Nonfunctional Cecum


Small Intestine
Stomach
Rectum
Anus
Mouth
Esophagus
Cecum
Large Intestine

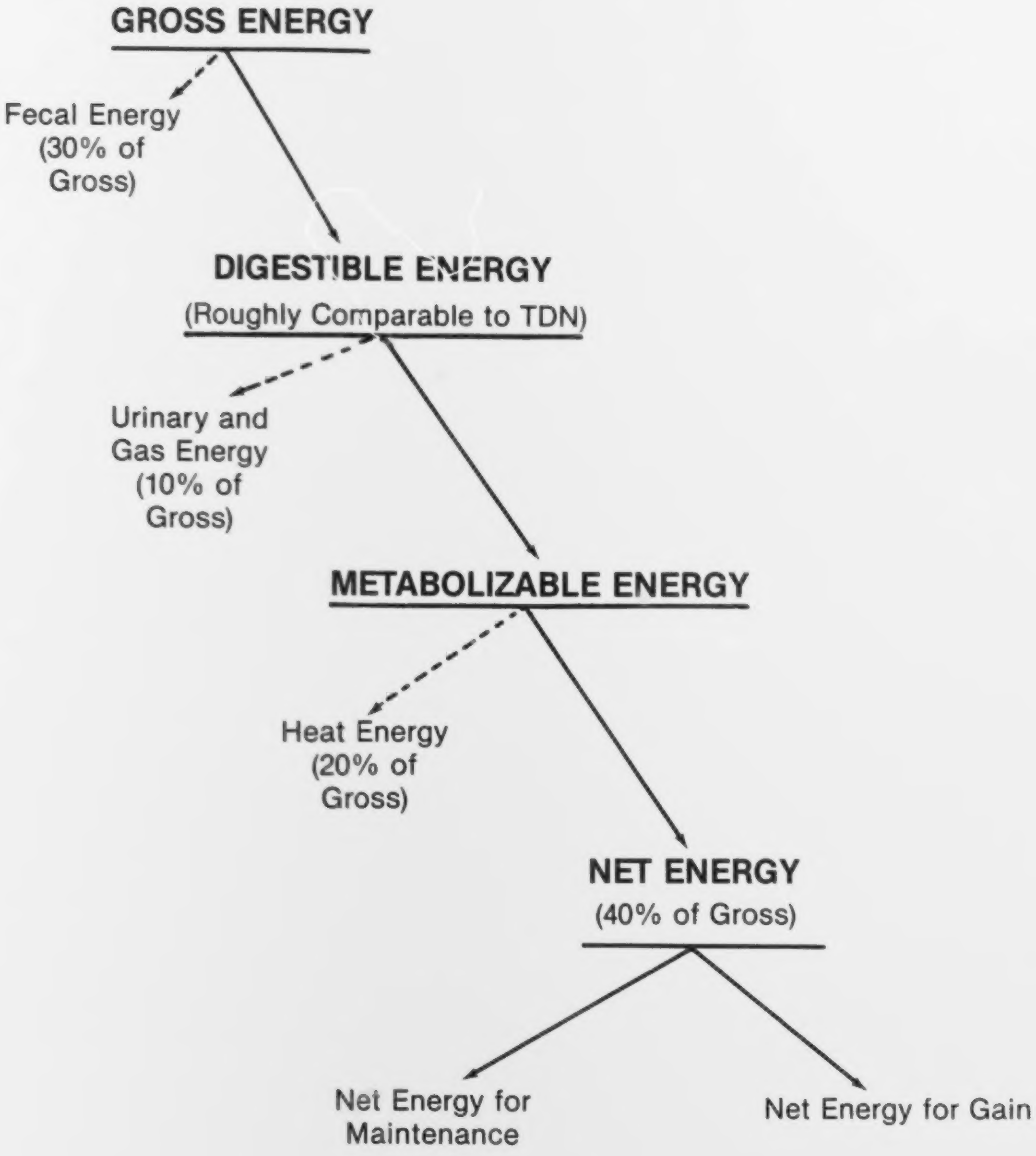
Major Parts of the Digestive Systems of Nonruminants

(Continued)

Avian


Ceca
Mouth
Large Intestine
Esophagus
Vent
Crop
Small Intestine
Proventriculus
(True Stomach)
Gizzard

Utilization of Energy in Net-Energy System



GROSS ENERGY

Fecal Energy
(30% of
Gross)

DIGESTIBLE ENERGY
(Roughly Comparable to TDN)

Urinary and
Gas Energy
(10% of
Gross)

METABOLIZABLE ENERGY

Heat Energy
(20% of
Gross)

NET ENERGY
(40% of Gross)

Net Energy for
Maintenance

Net Energy for Gain

INTERPRET NUTRITIONAL INFORMATION
UNIT I

INFORMATION SHEET

I. Terms and definitions associated with animal digestion and interpreting nutritional information

   A. Digestive system — Parts of animal's body involved in chewing and digesting feed, moving digested feed through the body, and absorbing the products of digestion

   B. Digestion — Process of breaking down feeds into simple substances that can be absorbed into the bloodstream and used by the body cells

   C. Cecum (pl., *ceca*) — Blind pouch located at the point where the small intestine joins the large intestine

   D. Nutrient — Class of food that aids in support of life and becomes part of the body cells

   E. Energy — Capacity for doing work or performing body functions for maintenance, work, production, reproduction, lactation, growth, or gain

II. Reasons for studying the digestive processes of animals

   A. Helps in selecting the proper feed for animal's type of digestive system

   B. Provides an understanding of the chemical and physical changes that take place after the animal eats feed

   C. Leads to more efficient livestock feeding at less cost

   (NOTE: The basis for the cost and efficiency factors in livestock feeding is the *feed-conversion ratio*, which is expressed as the number of pounds of feed needed to produce a pound of gain. For example, a feed-conversion ratio of 3:1 means that 3 pounds of feed will be needed to produce 1 pound of gain.)

III. Feed categories and their definitions

   A. Concentrate — Feed high in energy and low in fiber

   (NOTE: Concentrates, such as grains and high-protein additives, are used to supply the bulk of the protein and energy requirements of a ration.)

   B. Roughage — Feed high in fiber and low in energy

   (NOTE: Roughages, such as grasses, hays, and silages, consist of bulky, coarse plants or plant parts.)

INFORMATION SHEET

C. Supplement — Feed additive that improves the nutritional value of basic feed ingredients

(NOTE: Protein, minerals, vitamins, antibiotics, and combinations of these are added to feed as supplements.)

IV. Major classes of animal digestive systems and their definitions

A. Ruminants — Animals with large, four-compartment stomachs containing an enormous population of microorganisms, giving them both the capacity and means of processing and utilizing large quantities of bulky roughages

EXAMPLES: Cattle, sheep, goats

B. Nonruminants — Animals with relatively small and simple one-compartment stomachs containing limited microorganisms, making them better adapted to processing and utilizing concentrated feeds such as grains and meat products

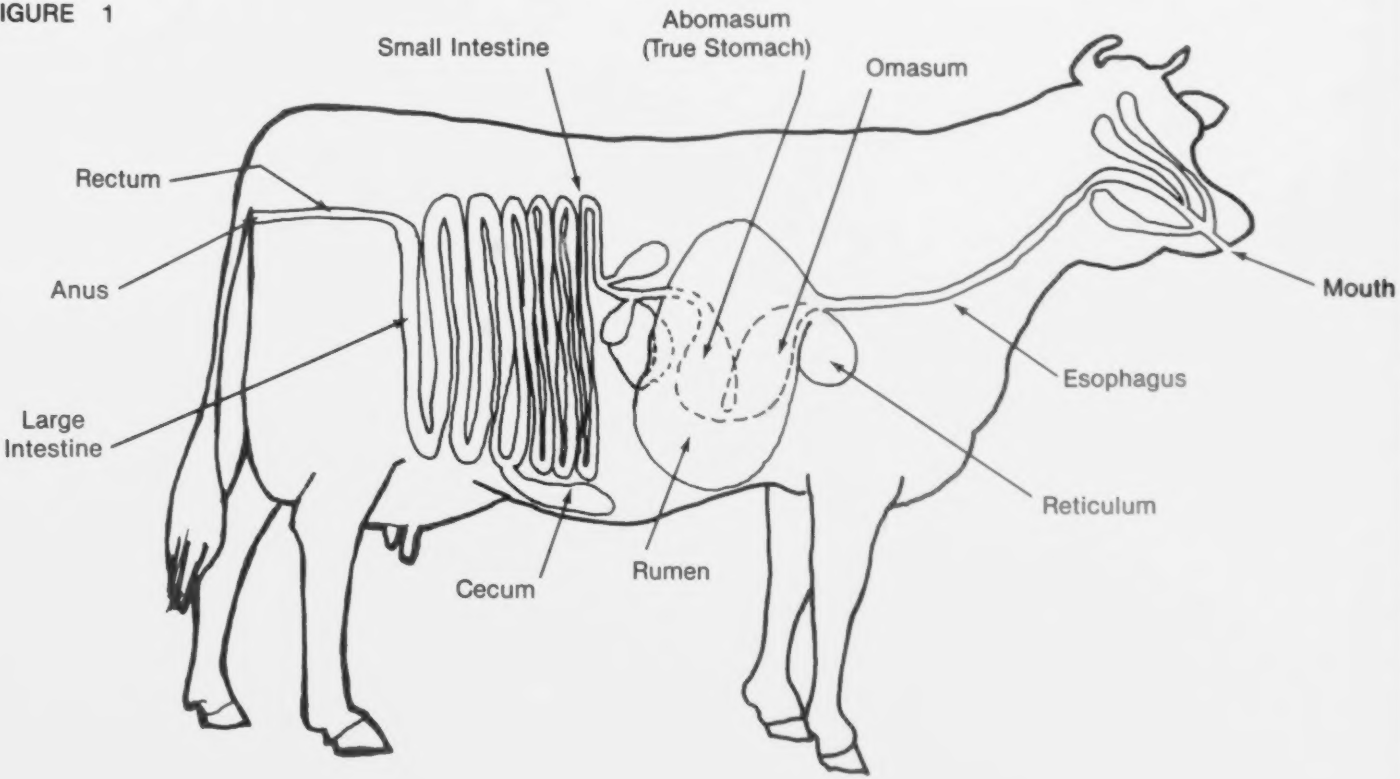
EXAMPLES: Horses, pigs, chickens, turkeys, man

INFORMATION SHEET

V. Major parts of the digestive system of ruminants (Figure 1)

(NOTE: Sheep and goats have digestive systems similar to that of cattle, except that they are proportionately smaller.)

FIGURE 1


Abomasum
(True Stomach)
Small Intestine
Omasum
Rectum
Anus
Mouth
Esophagus
Large
Intestine
Reticulum
Cecum
Rumen

INFORMATION SHEET

VI. Major steps in the digestive process of ruminants

A. Feed is taken into the mouth and chewed just enough to make swallowing possible

B. Feed moves down the esophagus to the rumen, where it is acted on by millions of microorganisms

C. Portion of feed in the form of a bolus (cud) is forced from rumen back into mouth, where it is rechewed and reswallowed

D. Feed returns to rumen/reticulum for further storage and action by microorganisms

E. Feed moves to omasum, where water is squeezed from the feed

(NOTE: The exact function of the omasum is not fully understood, but many researchers think that it serves to absorb water and possibly to grind the feed.)

F. Feed enters abomasum (true stomach), where it is mixed with digestive juices

G. Feed moves to small intestine, where the digestible portion is absorbed

H. Undigested portion of feed moves to large intestine, where it is formed into feces

I. Feces is stored in rectum until it is expelled through the anus

VII. Subdivisions of the nonruminant class and their definitions

A. Functional cecum — Nonruminant system where cecum is relatively large and functions, increasing animal's ability to digest the roughage in feeds

EXAMPLES: Horses, rabbits, guinea pigs, hamsters

B. Nonfunctional cecum — Nonruminant system where cecum is relatively small and has little function, limiting animal's ability to digest the roughage in feeds

EXAMPLES: Pigs, dogs, fish, man

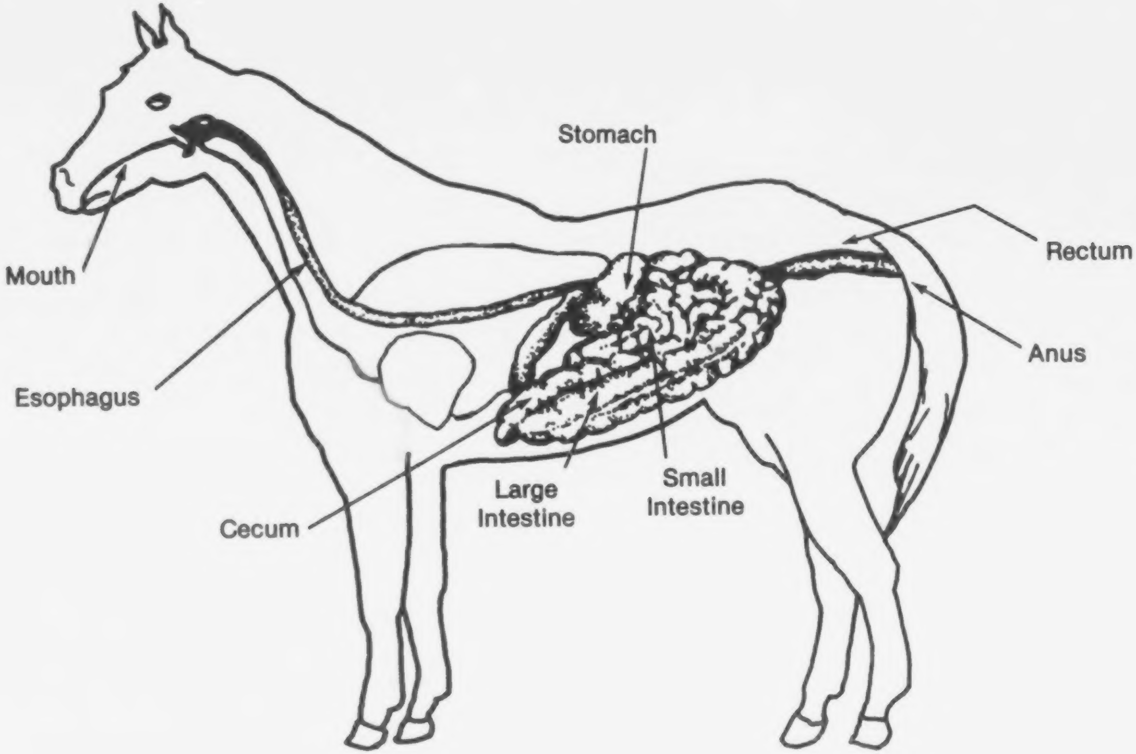
C. Avian — Nonruminant system where special organs (crop, gizzard) soften, crush, and grind feed

EXAMPLES: Chickens, turkeys (poultry)

VIII. Major parts of the digestive systems of nonruminants (Figures 2-4)

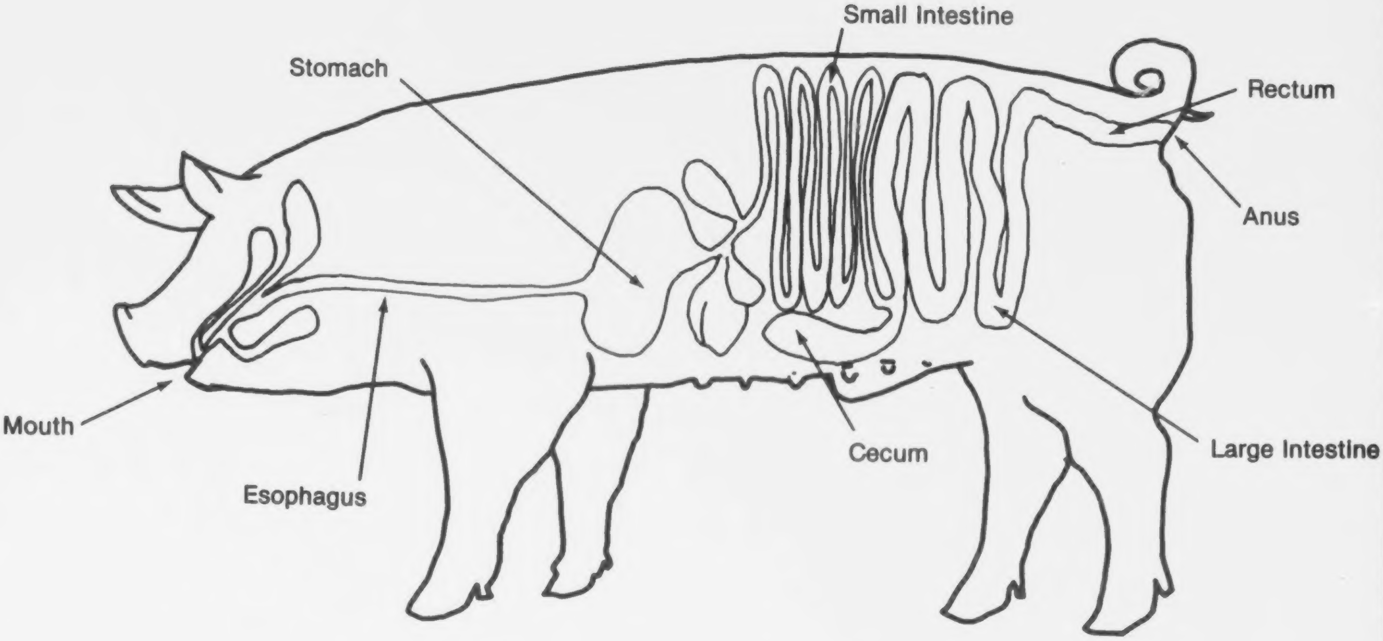
A. Functional cecum

FIGURE 2


Stomach
Rectum
Mouth
Anus
Esophagus
Small Intestine
Large Intestine
Cecum

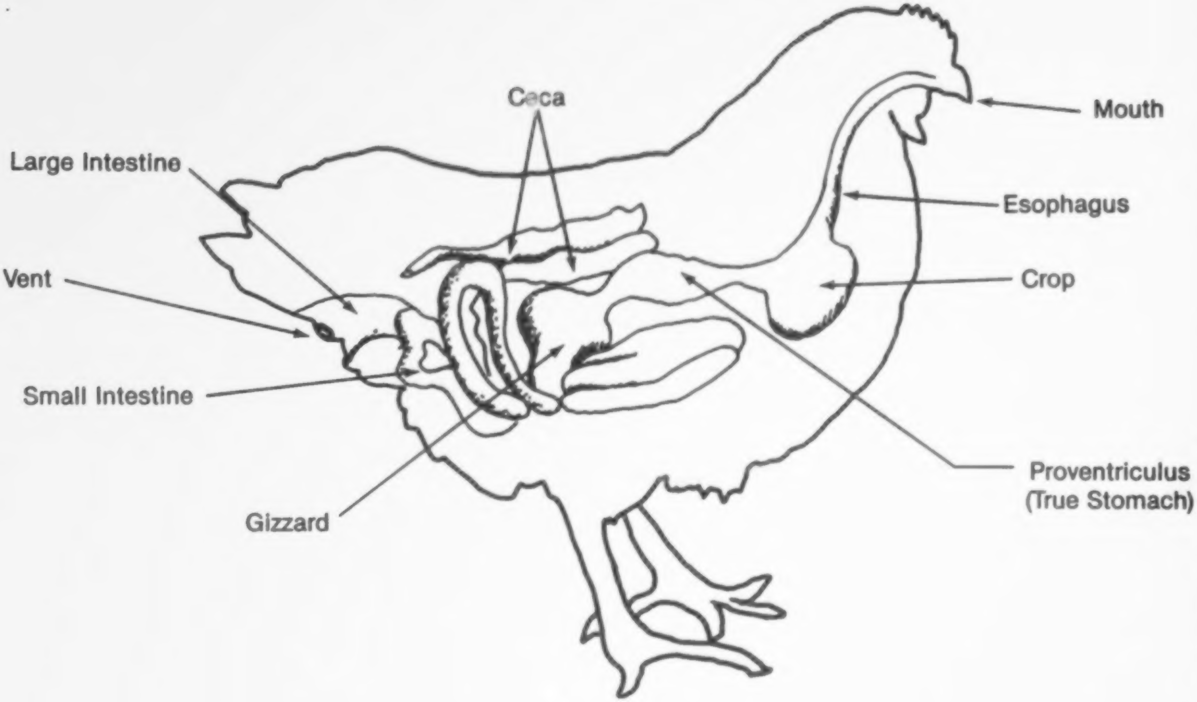
B. Nonfunctional cecum

FIGURE 3


Small Intestine
Stomach
Rectum
Anus
Mouth
Esophagus
Cecum
Large Intestine

C. Avian

FIGURE 4


Ceca
Mouth
Large Intestine
Esophagus
Vent
Crop
Small Intestine
Proventriculus
(True Stomach)
Gizzard

INFORMATION SHEET

IX. Major steps in the digestive processes of nonruminants

A. Functional and nonfunctional cecum systems

1. Feed is taken into the mouth, where it is chewed and mixed with saliva
2. Feed moves down the esophagus to the stomach, where it is churned and mixed with digestive juices
3. Feed moves into small intestine, where most of the digestible portion is absorbed
4. Feed moves into cecum

   (NOTE: In the cecum of functional-cecum animals, some additional digestion and absorption take place. In nonfunctional-cecum animals, the cecum has little function and the feed moves on through the digestive system.)

5. Undigested portion of feed moves into large intestine, where the water is absorbed and the rest is collected to form feces
6. Feces is stored in rectum until it is expelled through the anus

B. Avian system

1. Feed is taken into mouth
2. Feed immediately moves down the esophagus to the crop, where it is stored and soaked
3. Feed moves to proventriculus (true stomach), where it is mixed with digestive juices
4. Feed moves to gizzard, where it is crushed and ground
5. Feed moves through small intestine, ceca, and large intestine, where it is absorbed or formed into feces
6. Feces is expelled through the vent

X. Factors measured in determining ration formulations

(NOTE: Keep in mind that animals in confinement livestock operations must depend on the livestock producer to give them everything they need as far as nutrients are concerned. Also remember that those nutrients must be given in proper proportions or balance. If the nutrients are out of balance, the animals may be getting a nutritionally deficient ration and the producer may be wasting his or her feed money.)

INFORMATION SHEET

A. Amount of necessary nutrients available to animal from ration

B. Balance of nutrients available to animal from ration

C. Amount of energy available to animal from ration

D. Cost of ration

E. Feed-conversion ratio of ration

XI. Nutrients and their basic functions

(NOTE: All nutrients are important to an animal because each nutrient has a special function in the animal's body. Problems may occur when there is a deficiency of any one nutrient.)

A. Water

1. Promotes body's chemical reactions
2. Regulates body temperature
3. Forms the basis of the body's lubricants

B. Protein — Supplies material to build body tissues

(NOTE: The amino acids in protein are called the body's *building blocks*.)

C. Carbohydrates

1. Produce body heat to help keep animal warm
2. Provide energy for muscle movement

   EXAMPLES: Heartbeat, walking, breathing, digestive contractions

D. Fats

1. Provide energy and body heat
2. Carry fat-soluble vitamins that are in feed

E. Minerals

1. Provide material for growth of bones, teeth, and tissue
2. Regulate many of body's vital chemical processes

INFORMATION SHEET

F. Vitamins

1. Help in tooth and bone formation

2. Help prevent infection

3. Are essential for normal body functions

   EXAMPLES: Digestion, cell metabolism, growth, reproduction

XII. Sources of the types of protein found in ration formulations

(NOTE: The quality of the protein found in a ration is often more important than the quantity of protein in a ration. For example, swine rations must contain the protein [amino acid] lysine, and it is possible for pigs to perform better on a 12 percent protein ration that has been well balanced for amino acids than on a 16 percent protein ration that has a poor amino-acid balance.)

A. Plant protein

1. Soybean meal

   (NOTE: Soybeans are regarded as one of the highest quality plant proteins because they contain most of the essential amino acids needed by animals.)

2. Cottonseed meal

3. Linseed meal

4. Peanut meal

5. Sunflower-seed meal

B. Animal protein

(NOTE: Animal-protein sources are generally regarded as being higher in quality than most plant proteins because they contain the essential amino acids in the proper balance. However, they are not used as often as plant proteins because they are usually more expensive.)

1. Meat scraps

2. Tankage fish meal

3. Milk products

XIII. Systems used in evaluating ration formulations and their definitions

A. Total digestible nutrients (TDN) system — Process by which the amounts of certain digestible nutrients in a ration are computed by multiplying the percentage of each nutrient by its digestible coefficient

INFORMATION SHEET

(NOTE: TDN is usually expressed as a percent of the pounds of feed fed, which is determined with the following formula—

$$\text{Percent of TDN} = \frac{DCP + DCF + DNFE + (DEE \times 2.25)}{\text{Amount of Feed Consumed}} \times 100,$$

where DCP is the amount of digestible crude protein; DCF is the amount of digestible crude fiber; DNFE is the amount of digestible nitrogen-free extract; and DEE is the amount of digestible ether extract.

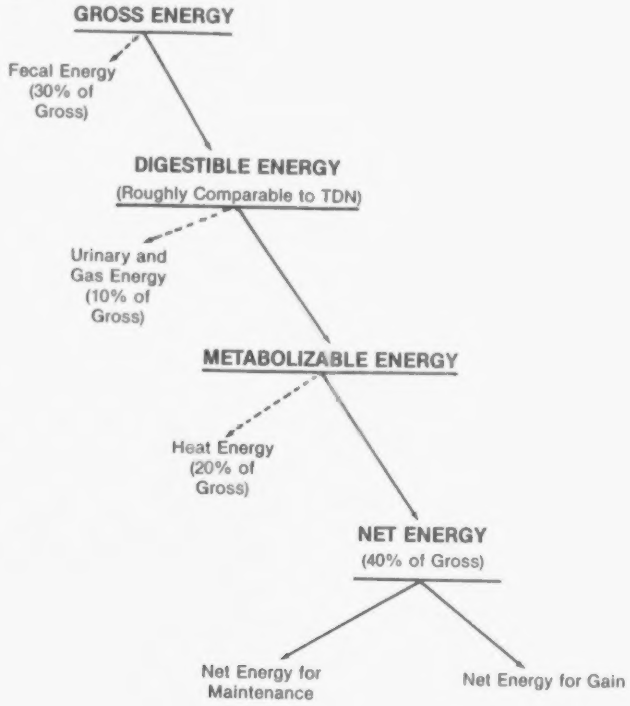
The values computed with this formula can be found in the feed-composition tables of many textbooks.)

B. Net-energy system (calorie system) — Process by which net energy for maintenance and net energy for gain are computed by deducting the fecal-, urinary-, gas-, and heat-energy losses from the gross energy contained in a ration (Figure 5)

(NOTE: Net energy is expressed in calories [cal], kilocalories [kcal], or megacalories [Mcal] per pound of feed fed. The values computed under the net-energy system can also be found in many textbooks.)

EXAMPLE:

FIGURE 5


GROSS ENERGY
Fecal Energy (30% of Gross)
DIGESTIBLE ENERGY
(Roughly Comparable to TDN)
Urinary and Gas Energy (10% of Gross)
METABOLIZABLE ENERGY
Heat Energy (20% of Gross)
NET ENERGY
(40% of Gross)
Net Energy for Maintenance
Net Energy for Gain

INFORMATION SHEET

XIV. Factors to consider when deciding which system to use to evaluate ration formulations

A. TDN system

1. System has been used for a very long time and people are familiar with it
2. There is a tremendous amount of TDN data on many feeds
3. System does not give a totally accurate measurement of the real value of a ration

B. Net-energy system (calorie system)

1. System gives a more precise measurement of the real value of a ration

   (NOTE: A more precise measurement of the value of a ration increases feed efficiency and thereby widens the producer's profit margin.)

2. System is new and people are less familiar with it
3. Real value of a ration is more difficult to determine
4. There is not as much data available on the system

   (NOTE: The net-energy system, because of its greater accuracy, is being used more and more in ration formulation, but as of now, various systems are in use for various species of livestock. See Table 1 below.)

   EXAMPLE:

TABLE 1: Manner in which energy requirements are expressed by species

Species	Total digestible energy	Gross energy	Digestible energy	Metabolizable energy	Net energy, maintenance	Net energy, gain	Net energy, lactation
Beef cattle	Yes	No	No	Yes	Yes	Yes	No
Dairy cattle	Yes	No	Yes	Yes	Yes	Yes	Yes
Sheep	Yes	No	Yes	Yes	No	No	No
Swine	No	No	Yes	Yes	No	No	No
Poultry	No	No	No	Yes	No	No	No
Horses	Yes	No	Yes	No	No	No	No

INFORMATION SHEET

XV. Basic theories that govern the net-energy system

(NOTE: The net-energy system is not a method of balancing rations; it is a system of [1] determining maintenance levels required by an animal, [2] predicting gain if feed intake is known, or [3] determining feed intake required for a desired amount of gain.)

A. A certain amount of energy is needed to maintain an animal at its present body weight

EXAMPLES: The daily net energy for maintenance (NE_m) requirement for a 1100-pound, growing and finishing steer is 8.14 megacalories (Mcal).

The daily net energy for maintenance (NE_m) requirement for a 1100-pound, dry, mature cow during the middle third of pregnancy is 8.14 megacalories (Mcal).

B. Additional energy is needed if an animal is breeding, pregnant, producing milk, growing, or fattening

EXAMPLES: The net energy for gain (NE_g) requirement for 1100-pound steer gaining 3.1 pounds per day is 9.22 megacalories (Mcal), which is calculated separately from the NE_m.

The daily net energy for gain (NE_g) requirement for 1100-pound, lactating, mature cow with average milking ability during the first three to four months of lactation is 11.1 megacalories (Mcal).

XVI. Resources needed when applying the net-energy system to livestock feeding

A. Table showing the energy requirements of the particular class of animal (Table 2)

EXAMPLE:

TABLE 2: Daily NE_m and NE_g requirements for beef steers

Body weight (lb)	220	331	441	551	661	772	882	992	1100
NE_m required	2.43	3.30	4.10	4.84	5.55	6.24	6.89	7.52	8.14
Daily gain (lb)					NE_g required				
0.2	0.17	0.23	0.28	0.34	0.39	0.43	0.48	0.52	0.56
0.4	0.34	0.46	0.57	0.68	0.78	0.88	0.97	1.06	1.14
0.7	0.52	0.70	0.87	1.03	1.18	1.33	1.47	1.61	1.74
0.9	0.70	0.95	1.18	1.40	1.60	1.80	1.99	2.17	2.34
1.1	0.89	1.20	1.49	1.77	2.02	2.27	2.51	2.74	2.97
1.3	1.08	1.46	1.81	2.15	2.46	2.76	3.05	3.33	3.60
1.5	1.27	1.73	2.14	2.53	2.90	3.26	3.60	3.93	4.25
1.8	1.47	2.00	2.47	2.93	3.36	3.77	4.17	4.55	4.92
2.0	1.68	2.27	2.82	3.33	3.82	4.29	4.74	5.18	5.60

INFORMATION SHEET

TABLE 2 (Continued)

Body weight (lb)	220	331	441	551	661	772	882	992	1100
NE_m required	2.43	3.30	4.10	4.84	5.55	6.24	6.89	7.52	8.14
Daily gain (lb)	NE_g required								
2.2	1.88	2.55	3.16	3.75	4.29	4.82	5.33	5.82	6.29
2.4	2.10	2.84	3.52	4.17	4.78	5.36	5.93	6.47	7.01
1.6	2.31	3.13	3.88	4.60	5.27	5.92	6.54	7.14	7.73
2.9	2.53	3.43	4.26	5.04	5.77	6.48	7.16	7.83	8.47
3.1	2.76	3.74	4.63	5.49	6.29	7.06	7.80	8.52	9.22
3.3	2.99	4.05	5.02	5.95	6.81	7.65	8.46	9.23	9.98

B. Table showing the nutrient composition of feed, with the appropriate energy designation for the animal being considered (Table 3)

EXAMPLE:

TABLE 3: Nutritional composition of sample feeds

	Net energy			DE		ME
	NE_m	NE_g	N_l	Ruminant	Horse	Swine
Feed name	Mcal/lb			Mcal/lb		Kcal/lb
Corn, dent yellow grain, Grade 2	.93	.61	.97	1.66	—	1544
Soybean meal	.78	.52	.77	1.47	—	—
Alfalfa hay (midbloom)	.54	.29	.52	1.12	.77	—

XVII. Abbreviations used in the net-energy system and their definitions

A. GE — Gross energy; the total combustible energy in a ration

B. DE — Digestible energy; that portion of a ration's GE that is not excreted in the feces

C. ME — Metabolizable energy; that portion of the GE that is not lost in the feces, urine, or gas

D. NE — Net energy; the energy fraction in a ration that is left after the fecal, urinary, gas, and heat losses are deducted from the GE; the energy available for maintenance and gain

INFORMATION SHEET

E. NE_m — Net energy available for maintenance

F. NE_g — Net energy available for gain

G. NE_l — Net energy available for maintenance, gain, pregnancy, and milk production for lactating cows

H. cal — Calorie; amount of energy as heat required to raise the temperature of 1 gram of water 1° C

I. kcal — Kilocalorie; amount of energy as heat required to raise the temperature of 1 kilogram of water 1° C; equivalent of 1000 calories

J. Mcal — Megacalorie; equivalent of 1000 kilocalories or 1,000,000 calories

XVIII. Extent to which primary energy-level considerations have been determined by species

(NOTE: The differences in the energy-level considerations listed below exist because the National Research Council has not finished their research at this time.)

A. Beef cattle — NE_m and NE_g

(NOTE: The NE_m and the NE_g for beef cattle are expressed in megacalories.)

B. Dairy cattle — NE_m, NE_g, and NE_l

(NOTE: The NE_m, NE_g, and NE_l for dairy cattle are expressed in megacalories.)

C. Swine — ME

(NOTE: The ME for swine is expressed in kilocalories.)

D. Sheep — ME

(NOTE: The ME for sheep is expressed in megacalories.)

E. Horses — DE

(NOTE: The DE for horses is expressed in megacalories.)

INTERPRET NUTRITIONAL INFORMATION
UNIT I

ASSIGNMENT SHEET #1 — INTERPRET NUTRITIONAL INFORMATION FROM TABLES

NAME ______________________________ SCORE ______________

Being able to read tables correctly and then to correctly interpret the information you find on tables are skills you must learn before you can begin to evaluate rations. Part I of this assignment sheet will give you practice in learning to read tables correctly. In Parts II and III, you will learn and then practice skills to help you interpret the information you receive from tables.

Carefully study the tables referred to in each of the sections below, and then follow the directions in each section.

PART I

A. Study Tables 4 and 5, found at the end of this assignment sheet, and then answer the questions that follow.

1. What is the daily NE_m requirement for a 661-pound steer? ______________ Mcal

2. What are the NE_m, NE_g, minimum dry-matter consumption, and total protein requirements for a 1102-pound beef steer that is gaining 2.6 pounds per day?

   a. NE_m = ______________________ Mcal

   b. NE_g = ______________________ Mcal

   c. Minimum dry-matter consumption = ______________________ lb

   d. Total protein = ______________________ lb

3. What is the expected daily gain for a 661-pound yearling beef steer consuming 15 pounds per day of a ration that provides 5.55 Mcal NE_m and 3.82 Mcal NE_g?

   Expected daily gain = ______________________ lb

4. What are the minimum dry-matter consumption, NE_m, NE_g, and TDN requirements of a 882-pound, pregnant, yearling beef heifer gaining 1.3 pounds per day during the last three to four months of pregnancy?

   a. Minimum dry-matter consumption = ______________________ lb

   b. NE_m = ______________________ Mcal

   c. NE_g = ______________________ Mcal

   d. TDN = ______________________lb

ASSIGNMENT SHEET #1

5. What are the minimum dry-matter consumption and NE_m requirements for a 992-pound, dry, pregnant, mature beef cow during the last third of pregnancy if she is gaining .9 pounds per day?

   a. Minimum dry-matter consumption = ______________________ lb

   b. NE_m = ______________________ Mcal

6. What are the NE_m and minimum dry-matter consumption requirements for a 1213-pound beef cow with average milking ability that is nursing a calf during the first three to four months postpartum?

   a. NE_m = ______________________ Mcal

   b. Minimum dry-matter consumption = ______________________ lb

B. Study Table 6, found at the end of this assignment sheet, and then fill in the blanks to complete the following statements.

1. ______________________ is the highest in crude protein for the energy feeds given, with a crude-protein level of ______________________ percent.

2. Corn, yellow dent, all analyses, provides ______________________ Mcal per pound of the NE_m for a ruminant.

3. Alfalfa hay, all analyses, provides ______________________ Mcal per pound of the NE_l for lactating cows.

4. If a 1000-pound cow consumes 20 pounds of alfalfa hay per day for winter maintenance, find the NE_m per day the cow will need by filling in the blanks on the formula below.

   Mcal per Pound × Pounds of Hay Consumed = Mcal of NE_m Cow Will Receive per Day, or ____________ × ____________ = ____________ Mcal NE_m. (Round your answer to the nearest hundredth.)

5. According to the table, ______________________ would be the best supplement to use to supply large amounts of both calcium and phosphorus.

ASSIGNMENT SHEET #1

6. The protein feed, ______________________, provides the highest percentage of crude protein, which is ______________________ percent.

7. If a 1100-pound mature horse at rest requires 16.39 Mcal of digestible energy per day, it will need ______________________ pounds of oats to meet its needs. (Round your answer to the nearest hundredth.)

8. If a beef ration contains corn, oats, barley, and cottonseed meal, fill in the chart below to indicate what percentage of the Mcal needed for maintenance and the Mcal needed for gain will be supplied by each ingredient.

Ingredient	Mcal per lb NE_m	Mcal per lb NE_g
Corn, yellow dent, all analyses	a. ______________	e. ______________
Oats, grain, all analyses	b. ______________	f. ______________
Barley, all analyses	c. ______________	g. ______________
Cottonseed meal, 41% protein	d. ______________	h. ______________

PART II

After you have learned to gather information from tables, you must be able to take that information and interpret it and turn it into useful facts, such as what will 1 pound of a proposed ration furnish an animal in terms of daily gain and maintenance and how much ration is needed per day to furnish an animal's total requirements. Study the steps given below and follow the example problem, and then your instructor will help you fill out the chart on the following page. This chart will guide you through an organized method of interpreting information you have pulled from tables.

Step #1 — Record in Columns 2 and 3 on chart NE_m and NE_g required per day by animal (from appropriate table for animal)

EXAMPLE: If you have a 992-pound steer and you want it to gain 2.6 pounds per day, its NE_m requirements would be 7.52 Mcal and its NE_g requirements would be 7.14 Mcal.

Step #2 — Record in Columns 4 and 5 on chart ration supply figures (from ration table)

EXAMPLE: NE_m = .82 Mcal; NE_g = .51 Mcal.

ASSIGNMENT SHEET #1

Step #3 — Calculate the amount (pounds) of ration required per day to meet animal's NE_m (Mcal), using the formula

Mcal of NE_m Required per Day (from Column 2) ÷ Mcal of NE_m Supplied per Lb of Ration (from Column 4) = Lb of Ration Required per Day to Meet NE_m.

EXAMPLE: 7.52 Mcal ÷ .82 Mcal per Lb = 9.17 Lb.

Record this figure in Column 6 on chart.

Step #4 — Calculate the amount (pounds) of ration required per day to meet animal's NE_g (Mcal), using the formula

Mcal of NE_g Required per Day (from Column 3) ÷ Mcal of NE_g Supplied per Lb of Ration (from Column 5) = Lb of Ration Required per Day to Meet NE_g.

EXAMPLE: 7.14 Mcal ÷ .51 Mcal per Lb = 14.00 Lb.

Record this figure in Column 7 on chart.

Step #5 — Calculate total amount (pounds) of ration required per day to meet both NE_m and NE_g, using the formula

Lb Required to Meet NE_m (from Column 6) + Lb Required to Meet NE_g (from Column 7) = Total Lb of Ration Required per Day.

EXAMPLE: 9.17 Lb + 14.00 Lb = 23.17 Lb.

Record this amount in Column 8 on chart.

Step #6 — Calculate feed-conversion ratio, using the formula

Total Lb of Ration Required per Day (from Column 7) ÷ Lb of Gain per Day (from Column 1) = Feed-Conversion Ratio

EXAMPLE: 23.17 Lb ÷ 2.6 Lb = 8.91 Lb, or 8.91: 1 Feed-Conversion Ratio

Record this figure in Column 9 on chart.

ASSIGNMENT SHEET #1

Refer to Table 4 and Table 7 to calculate the information requested on the chart below for a 992-pound steer. Show your calculations in the space provided below the chart. Carry your answers to the nearest hundredth.

	Steer's requirements per day		Ration supplies per pound for		Ration required per day for		Total ration required per day	Feed-conversion ratio
Gain per day (lb)	NE_m (Mcal)	NE_g (Mcal)	NE_m (Mcal)	NE_g (Mcal)	m (lb)	g (lb)	(lb)	(lb)
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6 (Col.2 ÷ Col. 4)	Column 7 (Col. 3 ÷ Col. 5)	Column 8 (Col. 6 + Col. 7)	Column 9 (Col. 8 ÷ Col. 1)
0	______	______*	______	______*	______	______	______	______ :1
2.2	______	______	______	______	______	______	______	______ :1
2.6	______	______	______	______	______	______	______	______ :1
2.9	______	______	______	______	______	______	______	______ :1
3.1	______	______	______	______	______	______	______	______ :1

*For 0 gain, you would have 0 NE_g.

ASSIGNMENT SHEET #1

PART III

Now, practice interpreting information from tables on your own with the aid of the steps below. Carefully read these steps, read the case study, refer to Tables 8 and 9 at the end of this assignment sheet, and then calculate the information requested on the chart. Round your calculations to the nearest hundredth, and show your work in the space provided below the chart. Be prepared to discuss your answers with the rest of the class.

Case Study

> You need to determine the ration required to meet the ME requirements for the following animals—a 400-pound bred sow, a 120-pound growing pig, a 350-pound lactating gilt, and a 450-pound lactating sow. Also, you want to be getting 1 pound of gain for each 3.5 pounds of ration consumed by the growing pig.

Step #1 — Record in Column 1 on chart animal's weight.

Step #2 — Record in Column 2 on chart animal's ME requirement per day (from appropriate table).

Step #3 — Record in Column 3 on chart kcal of ME ration supplies per pound (from appropriate table).

Step #4 — Calculate the amount (pounds) of ration required per day to meet animal's ME (kcal), using the formula

kcal of ME Required per Day (from Column 2) ÷ kcal Supplied per Lb of Ration (from Column 3) = Lb of Ration Required per Day.

Record this figure in Column 4 on chart.

Step #5 — Calculate daily gain expected for growing pig from ration fed to meet ME, using the formula

Lb of Ration Required per Day (from Column 4) ÷ 3.5 = Daily Gain Expected for Growing Pig.

Record this figure in Column 5 on chart.

ASSIGNMENT SHEET #1

Animal	Weight of animal (lb)	Animal's ME requirement per day (kcal)	ME ration supplies per pound (kcal)	Ration required per day to meet ME (lb)	Daily gain expected from ration fed to meet ME (lb)
	Column 1	Column 2	Column 3	Column 4 (Col. 2 ÷ Col. 3)	Column 5 (Col. 4 ÷ 3.5*)
Bred sow	____________	____________	____________	____________	
Growing pig	____________	____________	____________	____________	____________
Lactating gilt	____________	____________	____________	____________	
Lactating sow	____________	____________	____________	____________	

*As stated in the case study, 3.5 pounds of feed will produce 1 pound of gain. Since this pig is eating 5.29 pounds of feed per day (as shown in Column 4), divide the 5.29 by 3.5 to determine the pig's expected daily gain.

ASSIGNMENT SHEET #1

TABLE 4: Daily nutrient requirements for growing and finishing steer calves and yearlings

Weight of animal (lb)	Daily gain (lb)	Minimum dry-matter consumption (lb)	Roughage (%)	Total protein (lb)	Digestible protein (lb)	NE_m (Mcal)	NE_g (Mcal)	ME (Mcal)	TDN (lb)
331	0	6.2	100	0.51	0.29	3.30	0	5.6	3.5
	1.1	8.8	70-80	0.97	0.62	3.30	1.20	9.0	5.5
	1.5	8.6	50-60	1.08	0.73	3.30	1.73	9.6	6.0
	2.0	8.4	25-30	1.19	0.82	3.30	2.27	10.7	6.6
	2.4	8.2	<15	1.28	0.90	3.30	2.84	11.3	6.8
441	0	7.7	100	0.66	0.37	4.10	0	7.0	4.2
	1.1	12.8	80-90	1.26	0.77	4.10	1.49	12.1	7.5
	1.5	12.6	70-80	1.34	0.86	4.10	2.14	13.0	7.9
	2.0	10.8	35-45	1.34	0.88	4.10	2.82	13.3	8.2
	2.4	10.1	<15	1.39	0.95	4.10	3.52	14.1	8.6
551	0	9.7	100	0.77	0.44	4.84	0	8.2	5.1
	1.5	12.8	55-65	1.37	0.86	4.84	2.53	14.4	8.8
	2.0	13.7	45-50	1.52	0.97	4.84	3.33	16.2	9.9
	2.4	13.2	20-25	1.61	1.06	4.84	4.17	17.0	10.4
	2.9	13.2	<15	1.68	1.12	4.84	5.04	18.6	11.5
661	0	10.4	100	0.88	0.51	5.55	0	9.4	5.7
	2.0	17.9	55-65	1.79	1.10	5.55	3.82	19.5	11.9
	2.4	16.8	20-25	1.81	1.15	5.55	4.78	20.4	12.3
	2.9	15.6	<15	1.83	1.19	5.55	5.77	21.6	13.2
	3.1	16.1	<15	1.92	1.26	5.55	6.29	22.5	13.7
772	0	11.7	100	1.01	0.57	6.24	0	10.6	6.4
	2.0	17.6	45-55	1.76	1.08	6.24	4.29	20.8	12.8
	2.4	17.6	20-25	1.83	1.15	6.24	5.36	22.4	13.7
	2.9	17.6	<15	1.92	1.21	6.24	6.48	24.2	15.0
	3.1	18.1	<15	1.98	1.26	6.24	7.06	25.3	15.4
882	0	13.0	100	1.12	0.64	6.89	0	11.8	7.3
	2.2	20.7	45-55	1.92	1.19	6.89	5.33	24.5	15.0
	2.6	18.7	20-25	1.92	1.19	6.89	6.54	25.4	15.4
	2.9	19.0	<15	1.98	1.23	6.89	7.16	26.5	16.1
	3.1	19.8	<15	2.07	1.30	6.89	7.80	28.0	17.0
992	0	14.1	100	1.19	0.68	7.52	0	12.8	7.9
	2.2	22.7	45-55	2.12	1.26	7.52	5.82	26.7	16.3
	2.6	22.5	20-25	2.14	1.28	7.52	7.14	28.6	17.4
	2.9	20.5	015	2.14	1.30	7.52	7.83	29.0	17.6
	3.1	21.6	<15	2.16	1.32	7.52	8.52	30.5	18.5
1102	0	15.4	100	1.32	0.75	8.14	0	13.9	8.4
	2.0	23.1	45-55	2.09	1.23	8.14	5.60	27.1	16.5
	2.4	22.9	20-25	2.12	1.26	8.14	7.01	29.2	17.8
	2.6	21.2	<15	2.12	1.28	8.14	7.73	29.7	18.1
	2.9	22.0	<15	2.14	1.32	8.14	8.47	31.4	19.2

ASSIGNMENT SHEET #1

TABLE 5: Daily nutrient requirements for beef-cattle breeding herd*

Type of animal	Weight of animal (lb)	Daily gain (lb)	Minimum dry-matter consumption (lb)	Roughage (%)	Total protein (lb)	Digestible protein (lb)	NE_m (Mcal)	NE_g (Mcal)	ME (Mcal)	TDN (lb)
Pregnant yearling heifers—last 3 to 4 months of pregnancy										
	716	0.9	14.5	100	1.28	0.75	5.89	0.62	12.6	7.7
		1.3	18.7	100	1.65	0.93	5.89	1.52	16.2	9.9
		1.8	20.7	85-100	1.87	1.10	5.89	2.49	20.1	12.3
	772	0.9	15.2	100	1.34	0.77	6.23	0.65	13.2	8.1
		1.3	19.6	100	1.72	0.99	6.23	1.60	16.9	10.3
		1.8	22.0	85-100	1.94	1.12	6.24	2.63	21.1	12.9
	827	0.9	15.9	100	1.39	0.79	6.56	0.68	13.7	8.4
		1.3	20.5	100	1.79	1.01	6.56	1.68	17.7	10.8
		1.8	24.2	85-100	2.12	1.21	6.56	2.76	22.1	13.5
	882	0.9	16.5	100	1.43	0.84	6.89	0.71	14.2	8.7
		1.3	21.4	100	1.85	1.06	6.89	1.76	18.5	11.3
		1.8	25.6	85-100	2.23	1.26	6.89	2.90	23.0	14.0
	937	0.9	17.2	100	1.52	0.88	7.21	0.74	14.8	9.0
		1.3	22.3	100	1.94	1.10	7.21	1.84	19.2	11.7
		1.8	26.7	85-100	2.31	1.32	7.21	3.03	24.0	14.6
Dry, pregnant, mature cows—middle third of pregnancy										
	772	—	12.2	100	0.71	0.33	6.23	—	10.8	6.6
	882	—	13.4	100	0.79	0.37	6.89	—	11.9	7.3
	992	—	14.8	100	0.86	0.42	7.52	—	13.0	7.9
	1102	—	15.9	100	0.93	0.44	8.14	—	14.1	8.6
	1213	—	17.0	100	0.99	0.49	8.75	—	15.1	9.2
	1323	—	18.3	100	1.08	0.51	9.33	—	16.1	9.8
	1433	—	19.4	100	1.15	0.55	9.91	—	17.1	10.4
Dry, pregnant, mature cows—last third of pregnancy										
	772	0.9	15.2	100	0.90	0.42	7.8	—	13.2	8.0
	882	0.9	16.5	100	0.97	0.46	8.4	—	14.3	8.7
	992	0.9	17.9	100	1.06	0.51	9.1	—	15.4	9.4
	1102	0.9	19.0	100	1.12	0.53	9.7	—	16.4	10.0
	1213	0.9	20.1	100	1.19	0.55	10.3	—	17.5	10.7
	1323	0.9	21.4	100	1.26	0.60	10.9	—	18.5	11.2
	1433	0.9	22.5	100	1.32	0.64	11.5	—	19.6	11.9
Cows nursing calves—average milking ability—first 3 to 4 months postpartum										
	772	—	18.1	100	1.65	0.97	9.2	—	15.9	9.7
	882	—	19.4	100	1.79	1.06	9.9	—	17.0	10.4
	992	—	20.5	100	1.90	1.10	10.5	—	18.1	11.0
	1102	—	21.6	100	1.98	1.17	11.1	—	19.2	11.7
	1213	—	23.1	100	2.14	1.26	11.9	—	20.3	12.3
	1323	—	24.2	100	2.23	1.30	12.3	—	21.3	13.0
	1433	—	25.1	100	2.31	1.37	12.9	—	22.3	13.7

*Adapted from research done by the National Academy of Sciences.

ASSIGNMENT SHEET #1

TABLE 5 (Continued)*

Type of animal	Weight of animal (lb)	Daily gain (lb)	Minimum dry-matter consumption (lb)	Roughage (%)	Total protein (lb)	Digestible protein (lb)	NE_m (Mcal)	NE_g (Mcal)	ME (Mcal)	TDN (lb)
Cows nursing calves—superior milking ability—first 3 to 4 months postpartum										
	772		22.4	100	2.45	1.43	12.3	—	21.0	12.8
	882		23.8	100	2.58	1.52	13.0	—	22.1	13.5
	992		24.9	100	2.71	1.59	13.6	—	23.2	14.1
	1102		26.0	100	2.84	1.68	14.2	—	24.3	14.8
	1213		27.3	100	2.98	1.74	14.9	—	25.3	15.4
	1323		28.4	100	3.11	1.83	15.5	—	26.4	16.1
	1433		29.5	100	3.22	1.90	16.2	—	27.5	16.8

*Adapted from research done by the National Academy of Sciences.

TABLE 6: Average nutrient content of common feedstuffs

Feed name and/or description	Crude fiber	Crude protein	DE		ME		NE				
			Ruminant	Horse	Ruminant	Swine	Ruminant NE_m	Ruminant NE_g	Lactating cows NE_l	Ca	P
	(%)	(%)	(Mcal/lb)	(Mcal/lb)	(Mcal/lb)	(kcal/lb)	(Mcal/lb)	(Mcal/lb)	(Mcal/lb)	(%)	(%)
Energy feeds											
Barley, all analyses	5.0	12.2	1.45	1.26	1.19	1244	.78	.52	.76	.04	.33
Corn, yellow dent, all analyses	2.1	9.6	1.63	1.39	1.34	1306	.91	.62	.86	.03	.27
Milo grain, all analyses	2.3	10.6	1.56	—	1.28	1273	.86	.58	.82	.03	.28
Oats grain, all analyses	10.9	12.1	1.32	1.19	1.08	1202	.67	.44	.71	.06	.33
Wheat grain, all analyses	2.5	14.9	1.56	1.33	1.28	1478	.86	.58	.82	.03	.38
Protein feeds											
Soybean meal, 41% protein	6.0	43.8	1.51	—	1.22	1241	.86	.58	.98	.27	.63
Sugarcane molasses	—	26.3	.95	—	.78	—	.49	.31	.49	.79	.13
Cottonseed meal, 41% protein	11.3	40.9	1.39	1.14	1.14	1304	.73	.47	.72	.20	1.01
Dry forages											
Alfalfa hay, all analyses	27.2	15.9	1.13	.93	.96	523	.59	.33	.51	1.38	.20
Bermuda-grass hay, sun-cured	27.6	11.1	1.03	.78	.84	—	.50	.22	.51	.35	.17
Prairie hay, all analyses	30.0	6.1	.96	.76	.79	—	.47	.17	.48	.37	.13
Sudan hay	27.5	10.0	1.08	.76	.89	—	.53	.26	.53	.56	.29
Wheat straw	36.9	3.8	.76	.58	.63	—	.38	.00	.38	.19	.07
Mineral supplements											
Ground limestone	—	—	—	—	—	—	—	—	—	33.66	.02
Bone meal	—	—	—	—	—	—	—	—	—	25.95	12.42
Monosodium, phosphate	—	—	—	—	—	—	—	—	—	—	22.18

ASSIGNMENT SHEET #1

TABLE 7: Ration for finishing cattle

Ration ingredient	Amount of ingredient per 100 lb (lb)	NE_m ingredient supplies per 100 lb (Mcal)	NE_g ingredient supplies per 100 lb (Mcal)
Shelled corn	68.60	64.48	41.16
Soybean meal, solvent	4.00	3.12	2.08
Alfalfa hay, midbloom	27.00	14.58	7.83
Salt	0.40	—	—
TOTAL	100.00	82.18*	51.07**

*Use the figure .82 Mcal when calculating NE_m per pound of ration.
**Use the figure .51 when calculating the NE_g per pound of ration.

ASSIGNMENT SHEET #1

TABLE 8: Daily nutrient requirements for swine

Classification	Growing pigs	Growing pigs	Growing pigs	Bred gilts	Bred sows	Lactating gilts	Lactating sows	Young boars	Adult boars
Live weight (lb)	44-77	77-132	132-220	243-353	353-551	309-441	441-551	243-397	397-551
Daily feed intake (lb)	3.75	5.51	7.72	4.41	4.41	11.0	12.1	5.51	4.41
Nutrients (Energy and protein)	**Requirements**								
Metabolizable energy (kcal)	5390	7920	11,090	6340	6340	15,840	17,420	7920	6340
Crude protein (%)	16	14	13	14	14	15	15	14	14
Calcium (g)	11.0	12.5	17.5	15.0	15.0	37.5	41.2	18.8	15.0
Phosphorus (g)	8.5	10.0	14.0	10.0	10.0	25.0	27.5	12.5	10.0

ASSIGNMENT SHEET #1

TABLE 9: Ration for swine (14 percent crude protein)

Ration ingredient	Amount of ingredient per 100 lb (lb)	Crude protein ration supplies per 100 lb (%)	ME ingredient supplies per 100 lb (kcal)
Yellow corn	85.20	8.8	127,800
Soybean meal	14.80	44.0	21,830
TOTAL	100.00		149,630*

*Use the figure 1496.30 kcal when calculating ME per pound of ration.

(NOTE: This ration was balanced for 14 percent crude protein using the square method. The energy figures where then taken from a feed composition table and calculated to reflect the energy supplied by this blended ration. In reality, calcium and phosphorus content should be calculated also and then compared to the animal's calcium and phosphorus requirements. If the ration is found to be deficient, then a commercially prepared calcium/phosphorus premix should be added according to the manufacturer's recommendations.)

INTERPRET NUTRITIONAL INFORMATION
UNIT I

ASSIGNMENT SHEET #2 — USE THE TRIAL-AND-ERROR METHOD TO BALANCE A RATION AND USE THE NET-ENERGY SYSTEM TO PREDICT GAIN

NAME ______________________________ SCORE ____________

In order to balance an animal's ration, you must consider two things—the animal's digestive-system capabilities and the animal's nutritional requirements. Then once the ration is balanced, its effectiveness can be evaluated by using the net-energy system to predict daily gain from daily feed consumption. In this assignment sheet, you will practice using the trial-and-error method to balance one nutritional requirement (crude protein), and then you will use the net-energy system to predict gain. Study the example problem given in Part I of the assignment sheet to see how this is done, and then work through the problem in Part II on your own.

PART I

Assume that you are going to use the trial-and-error method (trying this or that until something works) to formulate a balanced finishing ration containing 11 percent crude protein for a 990-pound steer and that the ration will be formulated from corn, soybean meal, and prairie hay.

Some general rules of thumb are used when balancing rations for growing and finishing steers:

- The ration should contain 70 to 80 percent energy feeds.
- The ration should contain 10 to 20 percent roughages.
- The ration should contain approximately 10 percent protein supplement.
- The ration should contain 8.5 to 11.5 percent crude protein.
- The animal will consume approximately 1.7 to 2.5 percent of its body weight per day in feed.

Now, study Tables 10 and 11, at the end of this assignment sheet, and then follow the steps in the example below.

A: Using the trial-and-error method to formulate a ration

Step #1 — List the ration ingredients and the protein-level percentage of each ingredient

Ingredient	**Percent crude protein**
Corn	9.60
Soybean meal	43.80
Prairie hay	6.10

Step #2 — Assume that the animal will consume 2 percent of its body weight per day, and then calculate total ration animal can consume per day (lb), using the formula

Animal's Body Weight (Lb) × Percent of Body Weight Consumed per Day = Total Ration Animal Can Consume per Day (Lb), or

990 Lb × .02 = 19.80 Lb Total Ration Animal Can Consume per Day.

ASSIGNMENT SHEET #2

Step #3 — As stated, a steer's ration should be 70 to 80 percent energy feed (corn), approximately 10 percent protein supplement (soybean meal), and 10 to 20 percent roughage (prairie hay). With this in mind, try using the following percentages of corn, soybean meal, and hay to formulate a ration: corn, 75 percent; soybean meal, 10 percent, and prairie hay, 15 percent. Calculate the percentage of each ration ingredient that the steer will eat per day, using the formula

Total Ration Animal Can Consume per Day (Lb) × Percent of Each Ingredient in Ration = Lb of Each Ingredient Needed in Ration per Day, or

Corn 19.80 Lb × .75 = 14.85 Lb of Corn Needed per Day

Soybean meal 19.80 Lb × .10 = 1.98 Lb of Soybean Meal Needed per Day

Prairie hay 19.80 Lb × .15 = 2.97 Lb of Prairie Hay Needed per Day

TOTAL 19.80 Lb of Ration Animal Can Consume per Day

Step #4 — Calculate pounds of crude protein to be consumed per day, using the percentage of protein in each ingredient and the formula

Percent of Crude Protein in Each Ingredient × Lb of Ingredient to Be Consumed per Day = Lb of Crude Protein to Be Consumed per Day per Ingredient, or

Corn .096 × 14.85 Lb = 1.42560 Lb of Protein in Corn

Soybean meal .438 × 1.98 Lb = .86724 Lb of Protein in Soybean Meal

Prairie hay .061 × 2.97 Lb = .18117 Lb of Protein in Prairie Hay

TOTAL 2.47401, or 2.47 Lb of Crude Protein to Be Consumed per Day

Step #5 — Calculate the percentage of crude protein in ration, using the formula

Total Lb of Crude Protein to Be Consumed per Day ÷ Total Lb of Ration Animal Can Consume per Day = Percentage of Crude Protein in Ration, or

2.47 Lb ÷ 19.80 Lb = .1247474, or 12.47 Percent of Crude Protein in Ration

Since the 12.47 percent crude protein is considerably higher than the desired 11 percent crude protein that you need, try some fairly drastic changes in the make-up of the ration. First, the crude-protein content of the soybean meal is very high and the crude-protein level of the corn is fairly close to the desired 11 percent. So, cut back on the corn and soybean meal, add more prairie hay, and then calculate again.

ASSIGNMENT SHEET #2

Step #6 — (Same as Step #3 above) Use the formula

Total Ration Animal Can Consume per Day (Lb) × Percent of Each Ingredient in Ration = Lb of Each Ingredient Needed in Ration per Day, or

Corn 19.80 Lb × .70 = 13.860 Lb of Corn Needed per Day

Soybean meal 19.80 Lb × .07 = 1.386 Lb of Soybean Meal Needed per Day

Prairie hay 19.80 Lb × .23 = 4.554 Lb of Prairie Hay Needed per Day

TOTAL 19.800, or 19.80 Lb of Ration Animal Can Consume per Day

Step #7 — (Same as Step #4) Use the formula

Percent of Crude Protein in Each Ingredient × Lb of Ingredient to Be Consumed per Day = Lb of Crude Protein to Be Consumed per Day per Ingredient, or

Corn .096 × 13.860 Lb = 1.330560 Lb of Protein in Corn

Soybean meal .438 × 1.386 Lb = .607068 Lb of Protein in Soybean Meal

Prairie hay .061 × 4.554 Lb = .277794 Lb of Protein in Prairie Hay

TOTAL 2.215422, or 2.22 Lb of Crude Protein to Be Consumed per Day

Step #8 — (Same as Step #5) Use the formula

Total Lb of Crude Protein to Be Consumed per Day ÷ Total Lb of Ration Animal Can Consume per Day = Percentage of Crude Protein in Ration, or

2.22 Lb ÷ 19.80 Lb = .1121212, or 11 Percent of Crude Protein in Ration

Eleven percent crude protein is an acceptable ration to meet the crude-protein level desired. The final ration will consist of

70 percent corn

7 percent soybean meal

23 percent prairie hay.

ASSIGNMENT SHEET #2

This type of ration would be best utilized as a hand-fed ration where the corn and soybean meal are mixed together and the prairie hay is fed separately. To take this ration even further, ideally, you would need to also check to see if the ration is balanced for vitamins and minerals, which will not be done here.

B: Using the net-energy system to predict daily gain

Using the final ration above and the net-energy system, predict the steer's average daily gain if consuming the predicted 19.80 pounds of ration per day.

Step #1 — Use Table 10 and calculate to determine the NE_m (Mcal) and the NE_g (Mcal) supplied per pound by this ration if the 990-pound steer eats 19.80 pounds of the ration per day, using the formulas

Mcal of NE_m Supplied per Lb of Ingredient × Lb of Ration Ingredient to Be Consumed per Day = Mcal of NE_m Supplied per Day per Ingredient, or

Corn .91 Mcal × 13.860 Lb = 12.61260 Mcal Supplied by Corn

Soybean meal .86 Mcal × 1.386 Lb = 1.19196 Mcal Supplied by Soybean Meal

Prairie hay .47 Mcal × 4.554 Lb = 2.14038 Mcal Supplied by Prairie Hay

TOTAL 15.94494, or 15.94 Mcal of NE_m Supplied per Day

Mcal of NE_g Supplied per Lb of Ingredient × Lb of Ration Ingredient to Be Consumed per Day = Mcal of NE_g Supplied per Day per Ingredient, or

Corn .62 Mcal × 13.860 Lb = 8.59320 Mcal Supplied by Corn

Soybean meal .58 Mcal × 1.386 Lb = .80388 Mcal Supplied by Soybean Meal

Prairie hay .17 Mcal × 4.554 Lb = .77418 Mcal Supplied by Prairie Hay

TOTAL 10.17126, or 10.17 Mcal of NE_g Supplied per Day

Step #2 — Calculate the Mcal of NE_m supplied per pound of ration, using the formula

Mcal of NE_m Supplied per Day ÷ Lb of Ration Animal Can Consume per Day = Mcal of NE_m Supplied per Lb of Ration, or

15.94 Mcal ÷ 19.80 Lb = .8050505, or .81 Mcal Supplied per Lb of Ration

ASSIGNMENT SHEET #2

Step #3 — Calculate the pounds of ration needed to meet the steer's NE_m requirement, using the formula

Mcal of NE_m Required per Day ÷ Mcal Supplied per Lb of Ration = Lb of Ration Required per Day to Meet NE_m, or

7.52 Mcal ÷ .81 Mcal = 9.2839506, or 9.28 Lb of Ration Needed to Meet NE_m Requirements

Step #4 — Calculate pounds of ration available for gain after meeting NE_m requirements, using the formula

Lb of Ration Animal Can Consume per Day − Lb of Ration Needed to Meet NE_m Requirements = Lb of Ration Available for Gain, or

19.80 Lb − 9.28 Lb = 10.52 Lb of Ration Available for Gain

Step #5 — Calculate the Mcal of NE_g supplied per pound of ration, using the formula

Mcal of NE_g Supplied per Day ÷ Lb of Ration Animal Can Consume per Day = Mcal of NE_g Supplied per Lb of Ration, or

10.17 Mcal ÷ 19.80 Lb = .5136363, or .52 Mcal Supplied per Lb of Ration

Step #6 — Calculate total Mcal of NE_g, using the formula

Lb of Ration Available for Gain × Mcal of NE_g Supplied per Lb of Ration = Total Mcal of NE_g, or

10.52 Lb × .52 Mcal = 5.4704, or 5.47 Total Mcal of NE_g

Step #7 — Determine from Table 11 what the daily gain should be.

The table shows that for a 992-pound steer, 5.82 Mcal of NE_g will give 2.2 pounds of daily gain, so you can assume that your 990-pound steer consuming 19.80 pounds of ration per day will gain approximately 1.8 to 2.0 pounds per day.

PART II

Use the trial-and-error method to balance a ration for 12 percent crude protein for a 772-pound growing steer. The ration ingredients to be used are corn, oats, cottonseed meal, and bermuda-grass hay. Assume that the steer will consume 2 percent of its body weight per day in feed. The ration should consist of the following:

70 to 80 percent energy feeds (approximately 35 to 40 percent corn and 35 to 40 percent oats)
5 to 10 percent protein supplement (cottonseed meal)
10 to 20 percent roughage (bermuda-grass hay)

ASSIGNMENT SHEET #2

Study Tables 10 and 11, at the end of this assignment sheet to determine NE_g and NE_m and to be able to fill in the blanks below. Show your work, and round your answers to the nearest hundredth.

Step #1 — List the ration ingredients and the protein-level percentage of each ingredient.

Ingredient	Percent Crude Protein

Step #2 — Calculate total ration animal can consume per day (lb)

Animal's Body Weight	×	Percent of Body Weight Consumed per Day	=	Total Ration Animal Can Consume per Day (Lb)
	×		=	
	×		=	
	×		=	
	×		=	

Step #3 — Calculate the percentage of each ration ingredient that the steer will eat per day

Ingredient	Total Ration Animal Can Consume per Day (based on 2% of body weight)	×	Percent of Each Ingredient in Ration	=	Lb of Each Ingredient Needed in Ration per Day
		×		=	
		×		=	
		×		=	
		×		=	
			TOTAL	=	

ASSIGNMENT SHEET #2

Step #4 — Calculate pounds of crude protein consumed per day

Ingredient	Percent of Crude Protein in Each Ingredient	×	Lb of Ingredient to Be Consumed per Day	=	Lb of Crude Protein to Be Consumed per Day per Ingredient
________	______________	×	______________	=	____________
________	______________	×	______________	=	____________
________	______________	×	______________	=	____________
________	______________	×	______________	=	____________
			TOTAL	=	____________

Step #5 — Calculate the percentage of crude protein in ration

Total Lb of Crude Protein to Be Consumed per Day	÷	Total Lb of Feed to Be Consumed per Day	=	Percent of Crude Protein in Ration
________________	÷	________________	=	________________

(NOTE: Continue working through the problem on your own. Follow the steps in the trial-and-error method as necessary to balance ypur ration, and then follow the Steps 1 through 7 using the net-energy system to predict daily gain.)

TABLE 10: Average nutrient content of common feedstuffs, expressed as feed (partial listing only)

Feed name and/or description	Crude fiber	Crude protein	DE		ME		NE			Ca	P
			Ruminant	Horse	Ruminant	Swine	Ruminant NE_m	NE_g	Lactating cows NE_l		
	(%)	(%)	(Mcal/lb)	(Mcal/lb)	(Mcal/lb)	(kcal/lb)	(Mcal/lb)	(Mcal/lb)	(Mcal/lb)	(%)	(%)
Energy feeds											
Barley, all analyses	5.0	12.2	1.45	1.26	1.19	1244	.78	.52	.76	.04	.33
Corn, yellow dent, all analyses	2.1	9.6	1.63	1.39	1.34	1306	.91	.62	.86	.03	.27
Milo grain, all analyses	2.3	10.6	1.56	—	1.28	1273	.86	.58	.82	.03	.28
Oats grain all analyses	10.9	12.1	1.32	1.19	1.08	1202	.67	.44	.71	.06	.33
Wheat grain, all analyses	2.5	14.9	1.56	1.33	1.28	1478	.86	.58	.82	.03	.38
Protein feeds											
Soybean meal, 41% protein	6.0	43.8	1.51	—	1.22	1241	.86	.58	.98	.27	.63
Sugarcane molasses	—	26.3	.95	—	.78	—	.49	.31	.49	.79	.13
Cottonseed meal, 41% protein	11.3	40.9	1.39	1.14	1.14	1304	.73	.47	.72	.20	1.01
Dry forages											
Alfalfa hay, all analyses	27.2	15.9	1.13	.93	.96	523	.59	.33	.51	1.38	.20
Bermuda-grass hay, sun-cured	27.6	11.1	1.03	.78	.84	—	.50	.22	.51	.35	.17
Prairie hay, all analyses	30.0	6.1	.96	.76	.79	—	.47	.17	.48	.37	.13
Sudan hay	27.5	10.0	1.08	.76	.89	—	.58	.26	.53	.56	.29
Wheat straw	36.9	3.8	.76	.58	.63	—	.38	.00	.38	.19	.07
Mineral supplements											
Ground limestone	—	—	—	—	—	—	—	—	—	33.66	.02
Bone meal	—	—	—	—	—	—	—	—	—	25.95	12.42
Monosodium, phosphate	—	—	—	—	—	—	—	—	—	—	22.18

ASSIGNMENT SHEET #2

TABLE 11: Daily nutrient requirements for growing and finishing steer calves and yearlings

Weight of animal (lb)	Daily gain (lb)	Minimum dry-matter consumption (lb)	Roughage (%)	Total protein (lb)	Digestible protein (lb)	NE_m (Mcal)	NE_g (Mcal)	ME (Mcal)	TDN (lb)
331	0	6.2	100	0.51	0.29	3.30	0	5.6	3.5
	1.1	8.8	70-80	0.97	0.62	3.30	1.20	9.0	5.5
	1.5	8.6	50-60	1.08	0.73	3.30	1.73	9.6	6.0
	2.0	8.4	25-30	1.19	0.82	3.30	2.27	10.7	6.6
	2.4	8.2	<15	1.28	0.90	3.30	2.84	11.3	6.8
441	0	7.7	100	0.66	0.37	4.10	0	7.0	4.2
	1.1	12.8	80-90	1.26	0.77	4.10	1.49	12.1	7.5
	1.5	12.6	70-80	1.34	0.86	4.10	2.14	13.0	7.9
	2.0	10.8	35-45	1.34	0.88	4.10	2.82	13.3	8.2
	2.4	10.1	<15	1.39	0.95	4.10	3.52	14.1	8.6
551	0	9.7	100	0.77	0.44	4.84	0	8.2	5.1
	1.5	12.8	55-65	1.37	0.86	4.84	2.53	14.4	8.8
	2.0	13.7	45-50	1.52	0.97	4.84	3.33	16.2	9.9
	2.4	13.2	20-25	1.61	1.06	4.84	4.17	17.0	10.4
	2.9	13.2	<15	1.68	1.12	4.84	5.04	18.6	11.5
661	0	10.4	100	0.88	0.51	5.55	0	9.4	5.7
	2.0	17.9	55-65	1.79	1.10	5.55	3.82	19.5	11.9
	2.4	16.8	20-25	1.81	1.15	5.55	4.78	20.4	12.3
	2.9	15.6	<15	1.83	1.19	5.55	5.77	21.6	13.2
	3.1	16.1	<15	1.92	1.26	5.55	6.29	22.5	13.7
772	0	11.7	100	1.01	0.57	6.24	0	10.6	6.4
	2.0	17.6	45-55	1.76	1.08	6.24	4.29	20.8	12.8
	2.4	17.6	20-25	1.83	1.15	6.24	5.36	22.4	13.7
	3.1	18.1	<15	1.98	1.26	6.24	7.06	25.3	15.4
882	0	13.0	100	1.12	0.64	6.89	0	11.8	7.3
	2.2	20.7	45-55	1.92	1.19	6.89	5.33	24.5	15.0
	2.6	18.7	20-25	1.92	1.19	6.89	6.54	25.4	15.4
	2.9	19.0	<15	1.98	1.23	6.89	7.16	26.5	16.1
	2.9	17.6	<15	1.92	1.21	6.24	6.48	24.2	15.0
	3.1	19.8	<15	2.07	1.30	6.89	7.80	28.0	17.0
992	0	14.1	100	1.19	0.68	7.52	0	12.8	7.9
	2.2	22.7	45-55	2.12	1.26	7.52	5.82	26.7	16.3
	2.6	22.5	20-25	2.14	1.28	7.52	7.14	28.6	17.4
	2.9	20.5	<15	2.14	1.30	7.52	7.83	29.0	17.6
	3.1	21.6	<15	2.16	1.32	7.52	8.52	30.5	18.5
1102	0	15.4	100	1.32	0.75	8.14	0	13.9	8.4
	2.0	23.1	45-55	2.09	1.23	8.14	5.60	27.1	16.5
	2.4	22.9	20-25	2.12	1.26	8.14	7.01	29.2	17.8
	2.6	21.2	<15	2.12	1.28	8.14	7.73	29.7	18.1
	2.9	22.0	<15	2.14	1.32	8.14	8.47	31.4	19.2

INTERPRET NUTRITIONAL INFORMATION
UNIT I

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

PART I

A. 1. 5.55

2. a. 8.14 c. 21.2
   b. 7.73 d. 2.12

3. 2.0

4. a. 21.4 c. 1.76
   b. 6.89 d. 11.3

5. a. 17.9
   b. 9.1

6. a. 11.9
   b. 23.1

B. 1. Wheat grain, all analyses; 14.9

2. .91

3. .51

4. .59 × 20 = 11.80

5. Bone meal

6. Soybean meal, 41% protein; 43.8

7. 13.77

ANSWERS TO ASSIGNMENT SHEETS

8. a. .91
   b. .67
   c. .78
   d. .73
   e. .62
   f. .44
   g. .52
   h. .47

ANSWERS TO ASSIGNMENT SHEETS

PART II

	Steer's requirements per day		Requirements ration supplies per pound		Ration required per day for			
Gain per day (lb)	NE_m (Mcal)	NE_g (Mcal)	NE_m (Mcal)	NE_g (Mcal)	m (lb)	g (lb)	Total ration required per day (lb)	Feed-conversion ratio (lb)
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6 (Col.2 ÷ Col. 4)	Column 7 (Col. 3 ÷ Col. 5)	Column 8 (Col. 6 + Col. 7)	Column 9 (Col. 8 ÷ Col. 1)
0	7.52	0*	.82	0*	9.17	0	9.17	0 :1
2.2	7.52	5.82	.82	.51	9.17	11.41	20.58	9.35 :1
2.6	7.52	7.14	.82	.51	9.17	14.00	23.17	8.91 :1
2.9	7.52	7.83	.82	.51	9.17	15.35	24.52	8.45 :1
3.1	7.52	8.52	.82	.51	9.17	16.70	25.87	8.34 :1

*For 0 gain, you would have 0 NE_g.

ANSWERS TO ASSIGNMENT SHEETS

PART III

Animal	Weight of animal (lb)	Animal's ME requirement per day (kcal)	ME ration supplies per pound (kcal)	Ration required per day to meet ME (lb)	Daily gain expected from ration fed to meet ME (lb)
	Column 1	Column 2	Column 3	Column 4 (Col. 2 ÷ Col. 3)	Column 5 (Col. 4 ÷ daily gain)
Bred sow	400	6340	1496.30	4.24	
Growing pig	120	7920	1496.30	5.29	1.51
Lactating gilt	350	15,840	1496.30	10.58	
Lactating sow	450	17,420	1496.30	11.64	

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #2

Step #1

Ingredient	Percent Crude Protein
Corn	9.60
Oats	12.10
Cottonseed meal	40.90
Bermuda-grass hay	11.10

Step #2

Body Weight	×	Percent of Body Weight Consumed per Day	=	Total Ration Animal Can Consume per Day
772	×	.02	=	15.44

Step #3

Ingredient	Daily Consumption (based on 2% of body weight)	×	Percent of Each Ingredient in Ration	=	Lb of Each Ingredient in Ration per Day
Corn	15.44	×	.40	=	6.176
Oats	15.44	×	.35	=	5.404
Cottonseed meal	15.44	×	.05	=	.772
Bermuda-grass hay	15.44	×	.20	=	3.088
			TOTAL	=	15.440, or 15.44

Step #4

Ingredient	Percent of Crude Protein in Each Ingredient	×	Lb of Ingredient to Be Consumed per Day	=	Lbs of Crude Protein to Be Consumed per Day
Corn	.096	×	6.176	=	.592896
Oats	.121	×	5.404	=	.653884
Cottonseed meal	.409	×	.772	=	.315748
Bermuda grass hay	.111	×	3.088	=	.342768
			TOTAL	=	1.905296, or 1.91

Step #5

Total Lb of Crude Protein to Be Consumed per Day	÷	Total Lb of Ration Animal Can Consume per Day	=	Percent of Crude Protein in Ration
1.91	÷	15.44	=	.1237046, or 12.37

INTERPRET NUTRITIONAL INFORMATION
UNIT I

TEST

NAME ______________________________ SCORE ______________

1. Match to their correct definitions terms associated with animal digestion and interpreting nutritional information. Write the correct numbers in the blanks.

_____a. Class of food that aids in support of life and becomes part of the body cells

_____b. Process of breaking down feeds into simple substances that can be absorbed into the bloodstream and used by the body cells

_____c. Blind pouch located at the point where the small intestine joins the large intestine

_____d. Parts of animal's body involved in chewing and digesting feed, moving digested feed through the body, and absorbing the products of digestion

_____e. Capacity for doing work or performing body functions for maintenance, work, production, reproduction, lactation, growth, or gain

1. Digestive system
2. Digestion
3. Cecum (pl., *ceca*)
4. Nutrient
5. Energy

2. Discuss reasons for studying the digestive processes of animals.

____

____

____

____

3. Match categories of feed to their correct definitions. Write the correct numbers in the blanks.

_____a. Feed high in fiber and low in energy

_____b. Feed high in energy and low in fiber

_____c. Feed additive that improves the nutritional value of basic feed ingredients

1. Concentrate
2. Roughage
3. Supplement

TEST

4. Match major classes of animal digestive systems to their correct definitions. Write the correct numbers in the blanks.

______a. Animals with relatively small and simple one-compartment stomachs containing limited microorganisms, making them better adapted to processing and utilizing concentrated feeds such as grains and meat products

______b. Animals with large, four-compartment stomachs containing an enormous population of microorganisms, giving them both the capacity and means of processing and utilizing large quantities of bulky roughages

1. Ruminants
2. Nonruminants

TEST

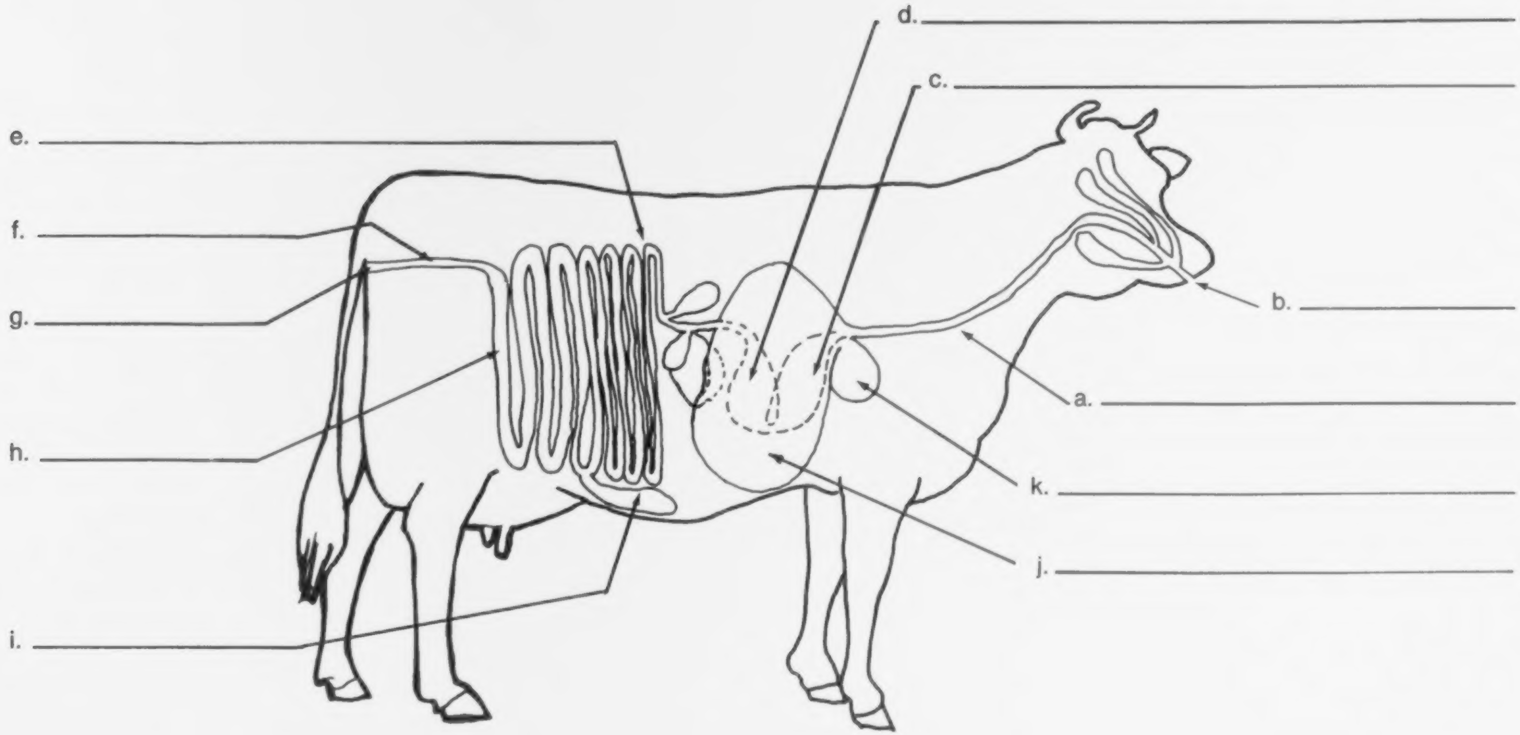
5. Identify the major parts of the digestive system of rumnants. Write the correct answers in the blanks.

Esophagus
Anus
Rectum

Rumen
Mouth
Small intestine

Reticulum
Abomasum
(true stomach)

Large intestine
Omasum
Cecum



TEST

6. Arrange in order the major steps in the digestive process of ruminants. Write a "1" in the blank before the first step, a "2" in the blank before the second step, and so on.

_____a. Feed moves to small intestine, where the digestible portion is absorbed

_____b. Feces is stored in rectum until it is expelled through the anus

_____c. Feed is taken into the mouth and chewed just enough to make swallowing possible

_____d. Feed moves to omasum, where water is squeezed from the feed

_____e. Feed moves down the esophagus to the rumen, where it is acted on by millions of microorganisms

_____f. Undigested portion of feed moves to large intestine, where it is formed into feces

_____g. Feed enters abomasum (true stomach), where it is mixed with digestive juices

_____h. Portion of feed in the form of a bolus (cud) is forced from rumen back into mouth, where it is rechewed and reswallowed

_____i. Feed returns to rumen/reticulum for further storage and action by microorganisms

7. Match subdivisions of the nonruminant class to their correct definitions. Write the correct numbers in the blanks.

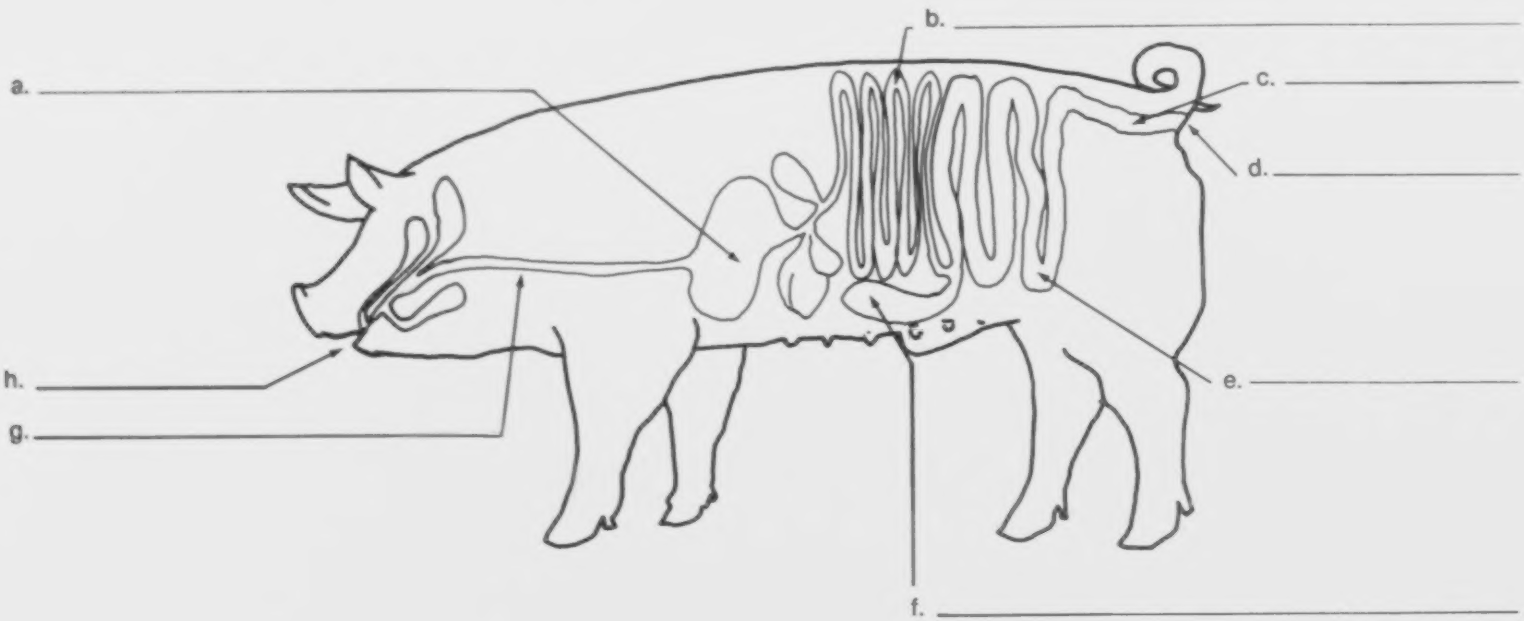
_____a. Nonruminant system where special organs (crop, gizzard) soften, crush, and grind feed	1. Functional cecum
	2. Avian
_____b. Nonruminant system where cecum is relatively small and has little function, limiting animal's ability to digest the roughage in feeds	3. Nonfunctional cecum
_____c. Nonruminant system where cecum is relatively large and functions, increasing animal's ability to digest the roughage in feeds	

TEST

8. Identify the major parts of the digestive systems of nonruminants. Write the correct answers in the blanks.

Nonfunctional cecum

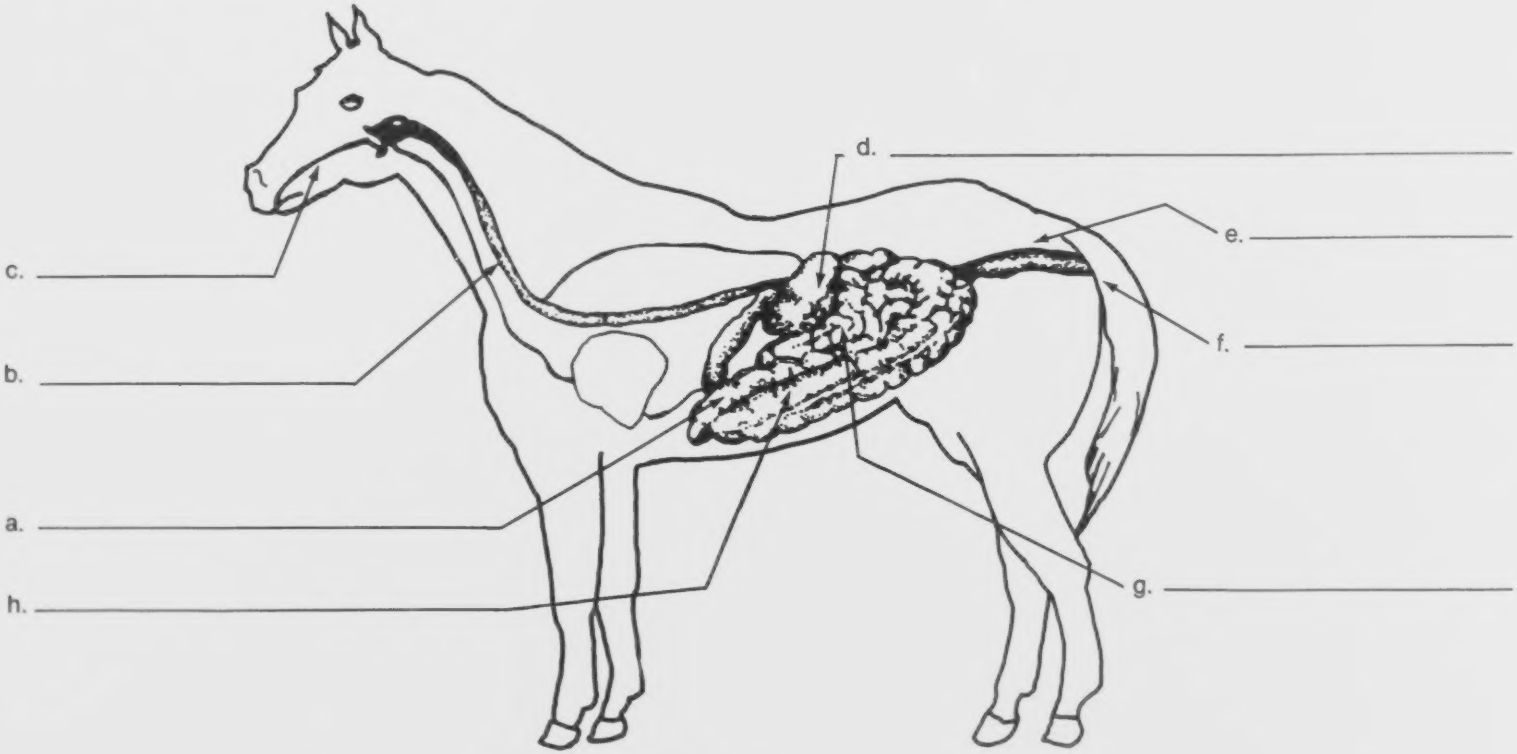
Stomach
Esophagus
Cecum
Small intestine
Large intestine
Rectum
Mouth
Anus



TEST

Functional cecum

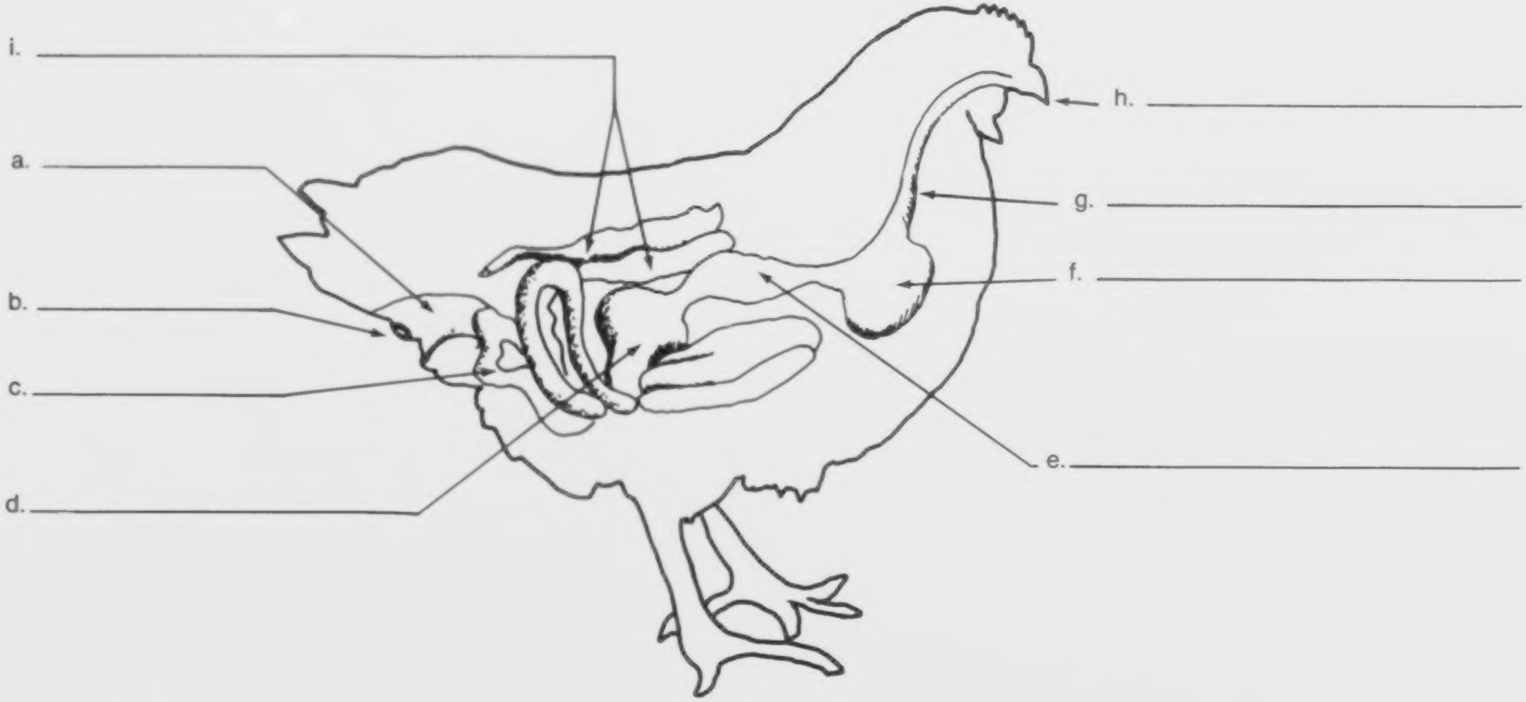
Mouth
Esophagus
Large intestine
Cecum
Small intestine
Stomach
Anus
Rectum



TEST

Avian

Mouth
Proventriculus
(true stomach)
Esophagus
Gizzard
Small intestine
Vent
Large intestine
Ceca
Crop



TEST

9. Arrange in order the major steps in the digestive processes of nonruminants. Write a "1" in the blank before the first step, a "2" in the blank before the second step, and so on for each of the sections below.

Functional and nonfunctional cecum systems

_____a. Feed moves into cecum

_____b. Undigested portion of feed moves into large intestine, where the water is absorbed and the rest is collected to form feces

_____c. Feed is taken into the mouth, where it is chewed and mixed with saliva

_____d. Feces is stored in rectum until it is expelled through the anus

_____e. Feed moves down the esophagus to the stomach, where it is churned and mixed with digestive juices

_____f. Feed moves into small intestine, where most of the digestible portion is absorbed

Avian system

_____a. Feed moves to proventriculus (true stomach), where it is mixed with digestive juices

_____b. Feed is taken into mouth

_____c. Feces is expelled through the vent

_____d. Feed moves to gizzard, where it is crushed and ground

_____e. Feed moves through small intestine, ceca, and large intestine, where it is absorbed or formed into feces

_____f. Feed immediately moves down the esophagus to the crop, where it is stored and soaked

10. Discuss factors measured in determining ration formulations.

____

____

____

____

____

TEST

11. Match nutrients to their basic functions. Write the correct numbers in the blanks. Answers will be used more than once.

______a. Are essential for normal body functions

______b. Carry fat-soluble vitamins that are in feed

______c. Forms the basis of the body's lubricants

______d. Produce body heat to help keep animal warm

______e. Help in tooth and bone formation

______f. Provide material for growth of bones, teeth, and tissue

______g. Provide energy and body heat

______h. Regulates body temperature

______i. Provide energy for muscle movement

______j. Promotes body's chemical reactions

______k. Help prevent infection

______l. Supplies material to build body tissues

______m. Regulate many of body's vital chemical processes

1. Water
2. Protein
3. Carbohydrates
4. Fats
5. Minerals
6. Vitamins

12. State sources for each of the types of protein found in ration formulations.

A. Plant protein (State three sources.)

1. ____

2. ____

3. ____

B. Animal protein (State two sources.)

1. ____

2. ____

TEST

13. Match to their correct definitions systems used in evaluating ration formulations. Write the correct numbers in the blanks.

_____a. Process by which net energy for maintenance and net energy for gain are computed by deducting the lost fecal-, urinary-, gas,- and heat-energy losses from the gross energy contained in a ration

_____b. Process by which the amounts of certain digestible nutrients in a ration are computed by multiplying the percentage of each nutrient by its digestible coefficient

1. Total digestible nutrients (TDN) system
2. Net-energy system (calorie system)

14. Discuss factors to consider when deciding which system to use to evaluate ration formulations.

a. TDN system

b. Net-energy system (calorie system)

15. State the basic theories that govern the net-energy system.

a. ______________________________

b. ______________________________

TEST

16. State resources needed when applying the net-energy system to livestock feeding.

a. ______________________________

____

b. ______________________________

____

17. Match abbreviations used in the net-energy system to their correct definitions. Write the correct numbers in the blanks.

_____a. Gross energy; the total combustible energy in a ration

_____b. Net energy available for maintenance

_____c. Megacalorie; equivalent of 1000 kilocalories or 1,000,000 calories

_____d. Net energy available for gain

_____e. Net energy available for maintenance, gain, pregnancy, and milk production for lactating cows

_____f. Net energy; the energy fraction in a ration that is left after the fecal, urinary, gas, and heat losses are deducted from the GE; the energy available for maintenance and gain

_____g. Calorie; amount of energy as heat required to raise the temperature of 1 gram of water 1° C

_____h. Digestible energy; that portion of a ration's GE that is not excreted in the feces

_____i. Kilocalorie; amount of energy as heat required to raise the temperature of 1 kilogram of water 1° C; equivalent of 1000 calories

_____j. Metabolizable energy; that portion of the GE that is not lost in the feces, urine, or gas

1. GE
2. DE
3. ME
4. NE
5. NE_m
6. NE_g
7. NE_l
8. cal
9. kcal
10. Mcal

TEST

18. State the extent to which primary energy-level considerations have been determined for each of the animals listed below.

a. Beef cattle — ____________________

b. Dairy cattle — ____________________

c. Swine — ____________________

d. Sheep — ____________________

e Horses — ____________________

(NOTE: Test item 19 lists the assignment sheet that is considered an important part of this test. If it has not been completed, check with your instructor.)

19. Interpret nutritional information from tables.

INTERPRET NUTRITIONAL INFORMATION
UNIT I

ANSWERS TO TEST

1. a. 4
   b. 2
   c. 3
   d. 1
   e. 5

2. Discussion should include the following
   a. Helps in selecting the proper feed for animal's type of digestive system
   b. Provides an understanding of the chemical and physical changes that take place after the animal eats food
   c. Leads to more efficient livestock feeding at less cost

3. a. 2
   b. 1
   c. 3

4. a. 2
   b. 1

5. a. Esophagus
   b. Mouth
   c. Omasum
   d. Abomasum (true stomach)
   e. Small intestine
   f. Rectum
   g. Anus
   h. Large intestine
   i. Cecum
   j. Rumen
   k. Reticulum

6. a. 7
   b. 9
   c. 1
   d. 5
   e. 2
   f. 8
   g. 6
   h. 3
   i. 4

7. a. 2
   b. 3
   c. 1

8. **Nonfunctional cecum**
   a. Stomach
   b. Small intestine
   c. Rectum
   d. Anus
   e. Large intestine
   f. Cecum
   g. Esophagus
   h. Mouth

ANSWERS TO TEST

Functional cecum

a. Cecum
b. Esophagus
c. Mouth
d. Stomach
e. Rectum
f. Anus
g. Small intestine
h. Large intestine

Avian

a. Large intestine
b. Vent
c. Small intestine
d. Gizzard
e. Proventriculus (true stomach)
f. Crop
g. Esophagus
h. Mouth
i. Ceca

9. **Functional and nonfunctional cecum systems**

a. 4
b. 5
c. 1
d. 6
e. 2
f. 3

Avian system

a. 3
b. 1
c. 6
d. 4
e. 5
f. 2

10. Discussion should include the following

a. Amount of necessary nutrients available to animal from ration
b. Balance of nutrients available to animal from ration
c. Amount of energy available to animal from ration
d. Cost of ration
e. Feed-conversion ratio of ration

11. a. 6
b. 4
c. 1
d. 3
e. 6
f. 5
g. 4
h. 1
i. 3
j. 1
k. 6
l. 2
m. 5

ANSWERS TO TEST

12. A. Plant protein (Answer should include any three of the following.)

    1. Soybean meal
    2. Cottonseed meal
    3. Linseed meal
    4. Peanut meal
    5. Sunflower-seed meal

    B. Animal protein (Answer should include any two of the following.)

    1. Meat scraps
    2. Tankage fish meal
    3. Milk products

13. a. 2
    b. 1

14. Discussion should include the following

    A. TDN system

    1. System has been used for a very long time and people are familiar with it
    2. There is a tremendous amount of TDN data on many feeds
    3. System does not give a totally accurate measurement of the real value of a ration

    B. Net-energy system (calorie system)

    1. System gives a more precise measurement of the real value of a ration
    2. System is new and people are less familiar with it
    3. Real value of a ration is more difficult to determine
    4. There is not as much data available on the system

15. a. A certain amount of energy is needed to maintain an animal at its present body weight
    b. Additional energy is needed if an animal is breeding, pregnant, producing milk, growing, or fattening

16. a. Table showing the energy requirements of the particular class of animal
    b. Table showing the nutrient composition of feed, with the appropriate energy designation for the animal being considered

17. a. 1
    b. 5
    c. 10
    d. 6
    e. 7
    f. 4
    g. 8
    h. 2
    i. 9
    j. 3

ANSWERS TO TEST

18. a. NE_m, NE_g
    b. NE_m, NE_g, NE_l
    c. ME
    d. ME
    e. DE

19. Evaluated to the satisfaction of the instructor

MAINTAIN ANIMAL HEALTH
UNIT II

UNIT OBJECTIVE

After completing this unit, the student should be able to perform basic skills associated with maintaining animal health. The student will show this ability by completing the assignment sheet, job sheets, and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with maintaining animal health.
2. List signs of a healthy animal.
3. List signs of an unhealthy animal.
4. Match common farm animals to their normal average temperature, pulse rate, and breathing rate.
5. Discuss factors to consider when developing a program for preventing ill health in animals.
6. Select from a list good management practices for maintaining animal health.
7. List major shelter requirements of livestock.
8. Match disinfectants and antiseptics to their correct uses/descriptions.
9. Select from a list factors to consider in disinfecting livestock facilities.
10. Match methods of administering medicine to their correct descriptions.
11. Label and discuss uses of equipment used to administer medications and to monitor health care of livestock.
12. Label illustrations of injection sites with the correct injection method and description.
13. Select from a list guidelines for proper vaccination of livestock.
14. Select methods, equipment, and locations for administering medication.
15. Demonstrate the ability to
    a. Fill a syringe.
    b. Take an animal's temperature.

OBJECTIVE SHEET

c. Give an intramuscular injection.

d. Give a subcutaneous injection.

e. Administer growth stimulant implants.

MAINTAIN ANIMAL HEALTH
UNIT II

SUGGESTED ACTIVITIES

I. Unit contents

   A. Objective sheet

   B. Suggested activities

   C. Transparency masters

      1. TM #1 — Subcutaneous (Sub Q) Injections

      2. TM #2 — Subcutaneous (Sub Q) Injections (Continued)

      3. TM #3 — Intramuscular (IM) Injections

      4. TM #4 — Intramuscular (IM) Injections (Continued)

      5. TM #5 — Intravenous (IV) Injections

      6. TM #6 — Intraperitoneal (IP) Injection

      7. TM #7 — Intraruminal (IR) Injection

      8. TM #8 — Infusion Intramammary (IMM)

      9. TM #9 — Intradermal (ID) Injection

   D. Information sheet

   E. Assignment Sheet #1 — Select Methods, Equipment, and Locations for Administering Medication

   F. Answers to assignment sheet

   G. Job sheets

      1. Job Sheet #1 — Fill a Syringe

      2. Job Sheet #2 — Take an Animal's Temperature

      3. Job Sheet #3 — Give an Intramuscular Injection

      4. Job Sheet #4 — Give a Subcutaneous Injection

      5. Job Sheet #5 — Administer Growth Stimulant Implants

   H. Test

   I. Answers to test

SUGGESTED ACTIVITIES

II. Instructor's guide

A. Review unit and plan presentation.

B. Obtain materials to supplement unit.

1. "Approved Practices in Swine Reproduction," set of 160 slides addressing swine herd health

   (NOTE: This slide set is available for purchase from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074-4364.)

2. Filmstrips

   a. *Preventative Health Care (Beef Cattle)*

   b. *Swine Health Care*

   (NOTE: The filmstrips above are available for purchase from Vocational Educational Productions, California Polytechnical State University, San Luis Obispo, California 93407.)

3. Filmstrip projector and overhead projector

4. Most recent edition of *Anchor Veterinary Handbook*

   (NOTE: This handbook is available from your local animal health supplies dealer or from Anchor Laboratories, Inc., a Division of Philips Roxane, Inc., St. Joseph, Missouri 64502. Order or obtain enough copies for each class member.)

5. Equipment and materials necessary for job sheet procedures

6. Examples of equipment listed in Information Sheet, Section XI.

7. Transparencies and competency profiles

   (NOTE: Transparencies and competency profiles are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074-4364.)

C. Provide students with unit.

D. Introduce unit.

SUGGESTIONS:

- Stress the financial importance of maintaining animal health, pointing out that in livestock production the margin of profit is narrow even in ideal conditions, and that unhealthy, unthrifty animals can quickly cut deeply into profits.

SUGGESTED ACTIVITIES

- Stress that the cost of preventative medicine is much less than the possible monetary losses that could be incurred due to an outbreak of disease.

- Discuss unit and specific objectives, pointing out that mastery of the specific objectives leads to accomplishment of the unit objective.

E. Discuss information, assignment, and job sheets.

1. Use Information Sheet, Section I to introduce students to terms and definitions associated with maintaining animal health.

   SUGGESTION:

   - Show students examples of suppositories, and make sure that they understand the differences between *pharmaceuticals* and *biologicals*, and *antiseptic* and *disinfectant*.

2. Use Information Sheet, Sections II and III to discuss signs of healthy and unhealthy animals.

   SUGGESTIONS:

   - Elaborate on each of the signs and discuss their application to the common livestock species so that students will learn how to recognize signs of healthy and unhealthy animals.

   - Take students on a field trip to a large-animal veterinary clinic so that they may observe signs of ill health in animals first hand.

   - Make sure that students can discern between contentment and alertness among the species. Remind students that cud chewing is an additional indicator of contentment in healthy ruminants.

3. Use Information Sheet, Section IV to discuss normal temperature, pulse rate, and breathing rate of common farm animals.

   SUGGESTIONS:

   - Remind students that this same chart is on page 44 of the *FFA Record Book*.

   - Stress the importance of being familiar with these statistics in order to check animals for abnormal conditions that might require medical attention.

SUGGESTED ACTIVITIES

- Demonstrate on young animals the procedures for checking these vital signs.

  (NOTE: Young animals are suggested for demonstration purposes because they are smaller than mature animals and easier to handle and control.)

4. Use Information Sheet, Sections V and VI to discuss factors to consider when developing a program for preventing ill health and good management practices in maintaining animal health.

   SUGGESTIONS:

   - Invite a reputable livestock producer or a veterinarian to discuss the ramifications of these practices and factors.
   - Plan to cover this information during a tour of an outstanding operation.
   - Stress the importance of comprehensive and routine sanitation practices.

5. Use Information Sheet, Section VII to discuss major shelter requirements of livestock.

   SUGGESTIONS:

   - Point out that these requirements become even more critical in large operations, especially in confinement or semiconfinement situations.
   - Invite a local producer with good facilities to show the students his or her facilities and to explain how space requirements were met.
   - Discuss each of the requirements in depth, citing examples of right and wrong construction, design, or location, and allowing students to give additional examples from their experience.

6. Use Information Sheet, Sections VIII and IX to discuss disinfectants, antiseptics, and methods of disinfecting livestock facilities.

   SUGGESTIONS:

   - Give students examples of effective disinfectant techniques from your experience.
   - Invite a local supplier or veterinarian to discuss disinfectants and antiseptics and their uses.
   - Mention brand names of some of the generic products listed in the information sheet. Students are sometimes more familiar with a brand name than with a generic name, and you want them to make the correct association.

SUGGESTED ACTIVITIES

- Stress the importance of reading and following all label instructions and cautions. Give students samples of some of the products listed in this section of the information sheet, and let them read the labels. Quiz them orally on pertinent label information.

- Be sure to point out that disinfection of livestock facilities includes outdoor pens or lots as well as buildings.

7. Use Information Sheet, Section X to discuss methods of administering medicine to livestock.

SUGGESTIONS:

- Have actual products available to show the students that the label explains the correct method of administering the medicine: topical, oral, injectable, etc.

- Take students to a veterinary clinic where they can observe these methods of medication administration being used.

- Allow students who have administered medication by one of these methods to share their experiences with the class.

- Stress the importance of properly restraining the animal before administration.

8. Use Information Sheet, Section XI to discuss and demonstrate livestock medication application equipment.

SUGGESTIONS:

- Show students examples of each piece of equipment listed in this section of the information sheet.

- Invite a veterinarian to discuss and demonstrate the use of this equipment.

- Invite students who may have acquired skill at using a particular piece of the equipment to explain and demonstrate that piece of equipment.

9. Use Information Sheet, Section XII to discuss correct injection sites and methods.

SUGGESTIONS:

- Use Transparencies #1 through #9 to illustrate your discussion.

- Show students the proper sites on live animals when possible.

SUGGESTED ACTIVITIES

- Display a variety of injectable products, and point out to the students that the appropriate injection method is given on the label.
- Demonstrate Job Sheets #1 through #5 and then allow students to perform the job sheets and practice these skills.
- Have students complete Assignment Sheet #1 to reinforce their knowledge of the information covered in Information Sheet, Sections X through XII.

10. Use Information Sheet, Section XIII to discuss guidelines for proper vaccination of livestock.

    SUGGESTION:

    - Explain the consequences of not following specific guidelines.

      EXAMPLE: Live biologicals exposed to sunlight will be killed and thus rendered useless.

F. Show media materials to summarize parts of the unit and to show some of the information being applied.

G. Review and summarize, allowing student discussion and questions.

H. Give test.

I. Critique test and discuss in class.

J. Complete appropriate section of competency profiles.

III. Unit references

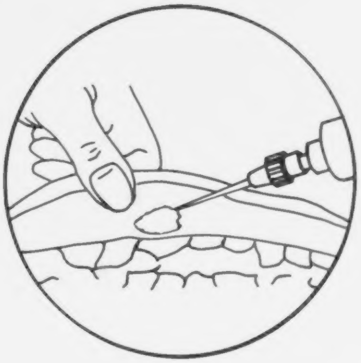
A. *Anchor Veterinary Handbook*, 17th ed. St. Joseph, Missouri: Anchor Laboratories, Inc., A Division of Philips Roxane, Inc., 1983.

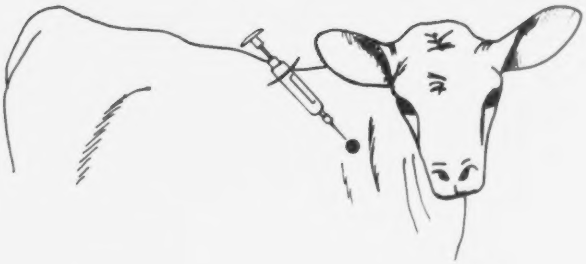
B. Battaglia, Richard A., and Vernon B. Mayrose. *Handbook of Livestock Management Techniques*. Minneapolis, Minnesota: CEPCO Division, Burgess Publishing Company, 1981.

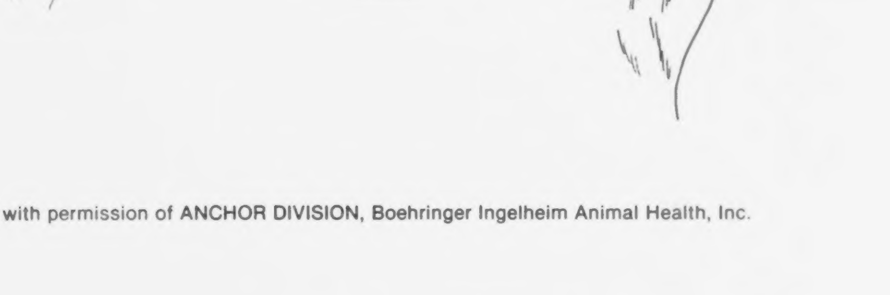
C. Pierce, Greg. *Agricultural Livestock Skills*. Stillwater, Oklahoma: State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1979.

D. Rudolph, James A. *Equine Management and Production*. Stillwater, Oklahoma: State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1980.

Subcutaneous (Sub Q) Injections







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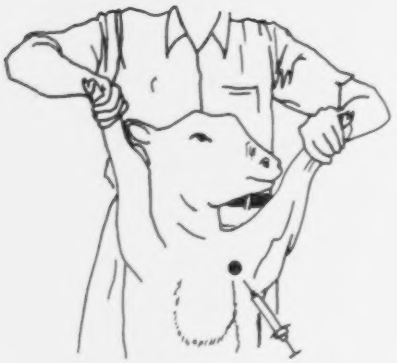
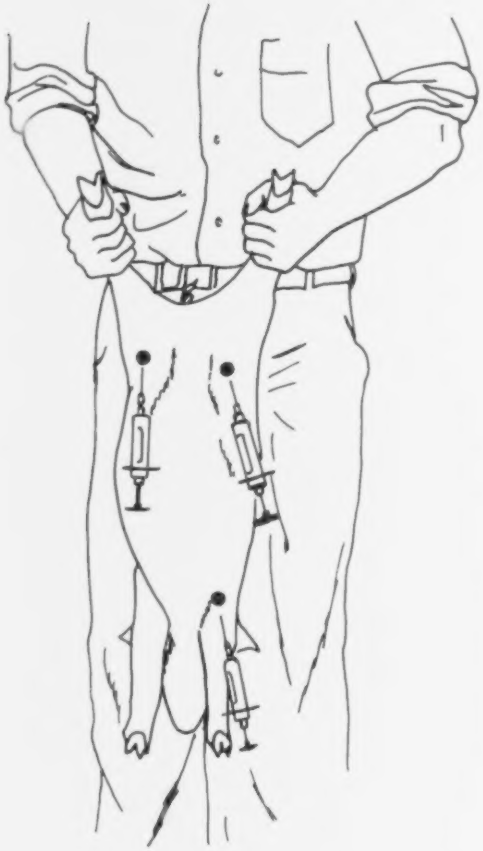
TM #1

Subcutaneous (Sub Q) Injections
(Continued)





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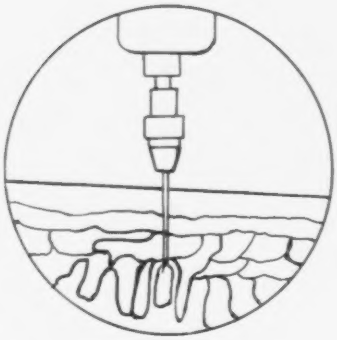
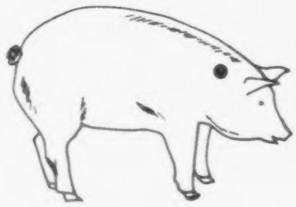
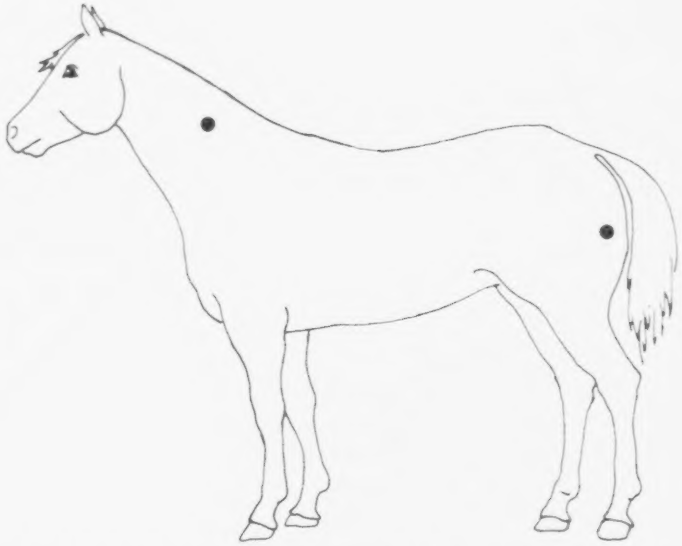
Intramuscular (IM) Injections







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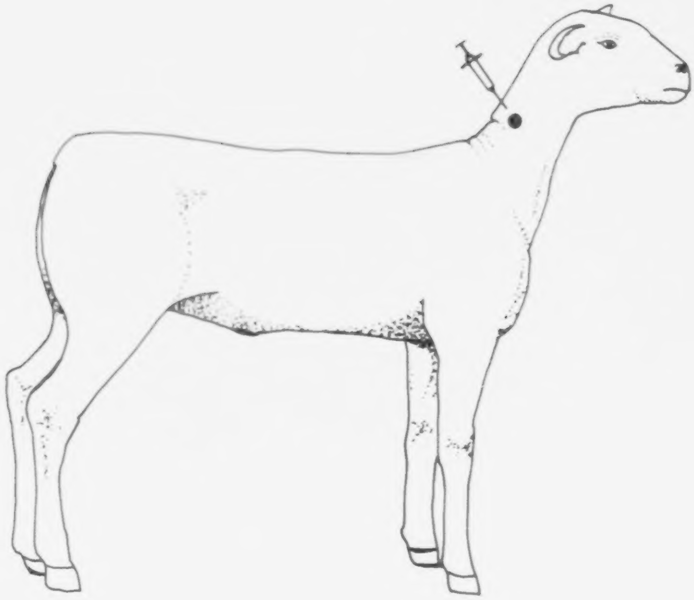
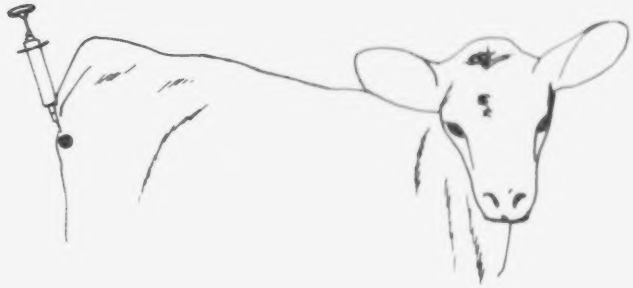
Intramuscular (IM) Injections
(Continued)





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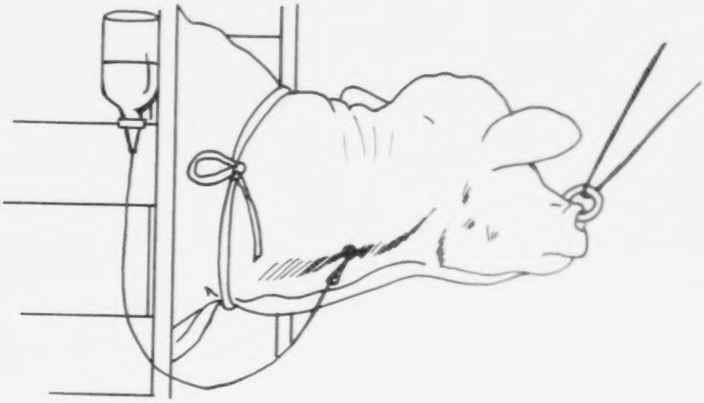
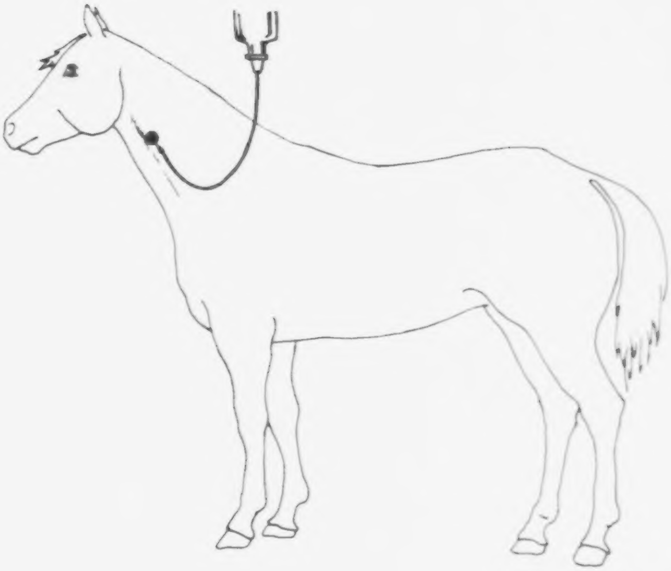
Intravenous (IV) Injections





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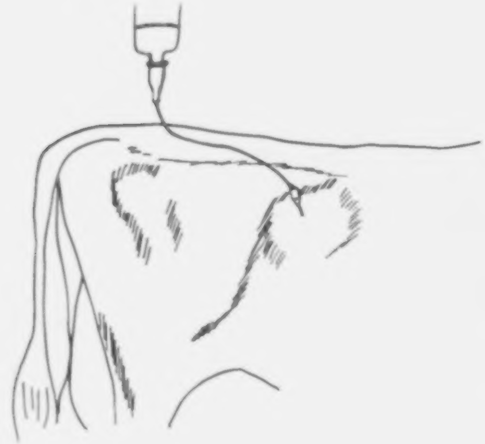
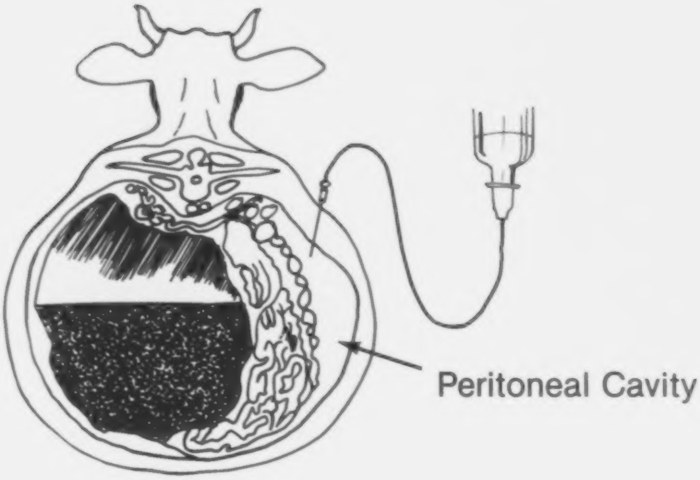
Intraperitoneal (IP) Injection




Peritoneal Cavity

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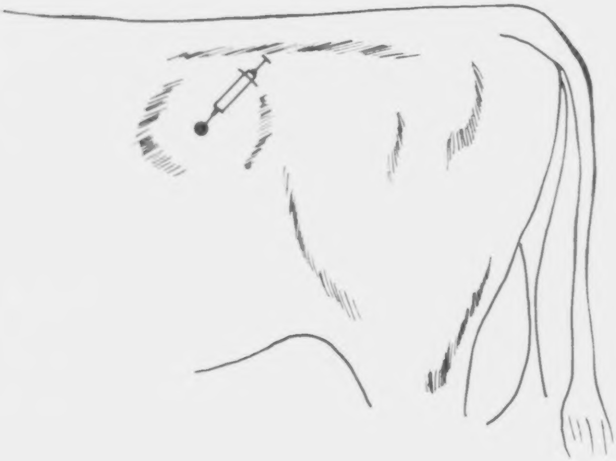
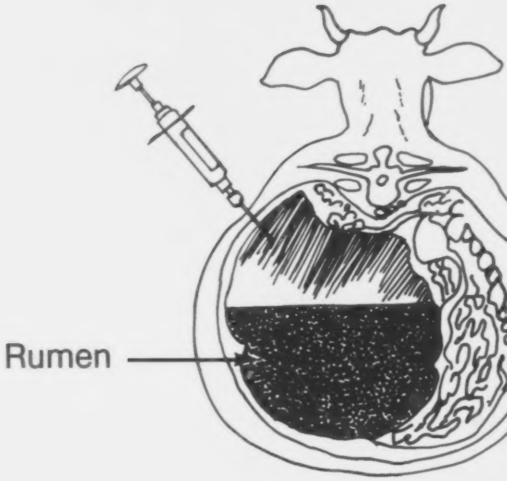
TM #6

Intraruminal (IR) Injection





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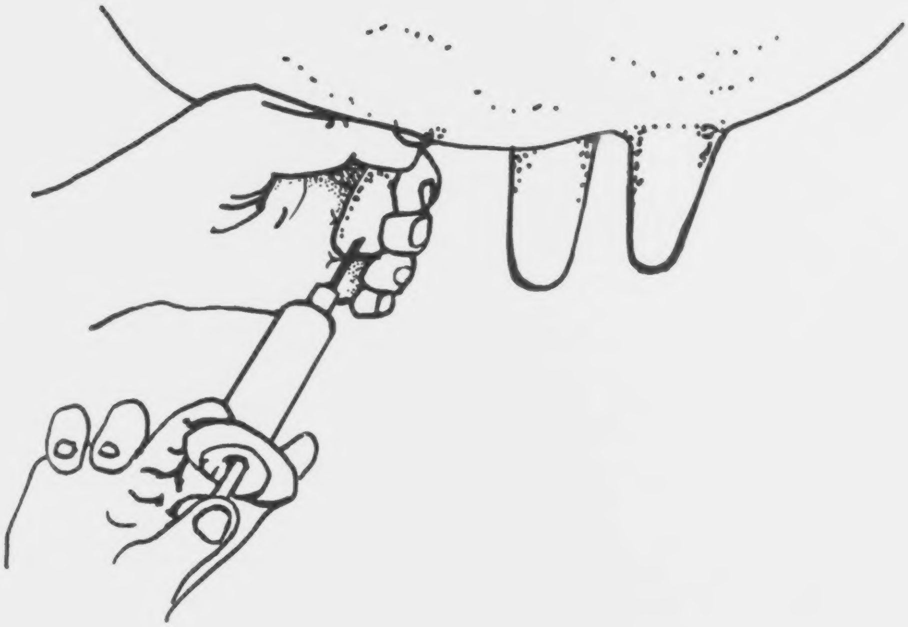
Infusion Intramammary (IMM)



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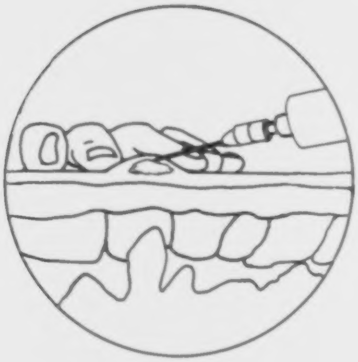
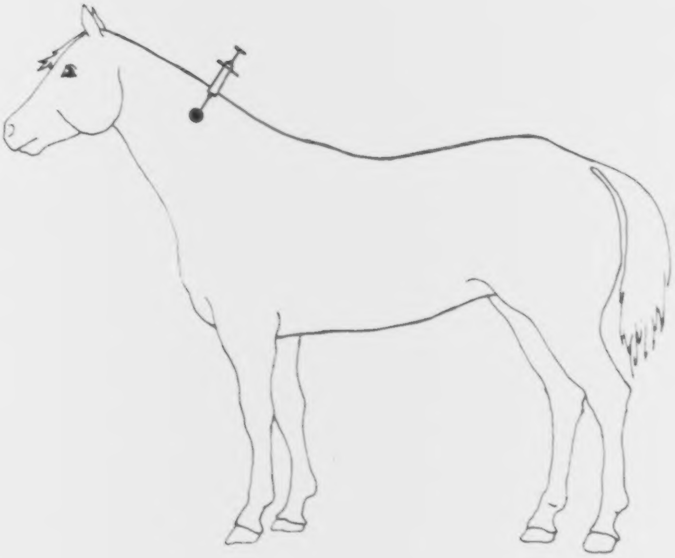
Intradermal (ID) Injection





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MAINTAIN ANIMAL HEALTH
UNIT II

INFORMATION SHEET

I. Terms and definitions

A. Health — Physical well-being; freedom from disease, pain, or defect

B. Disease — Any deviation of body from its normal healthy state

C. Bacteria — One-celled microorganisms that may be either harmful or beneficial and can be seen with a microscope

(NOTE: Harmful bacteria cause such diseases as pneumonia, tuberculosis, anthrax, and tetanus. Many harmful bacteria can be successfully treated with antibiotics.)

D. Virus — Tiny ultramicroscopic or submicroscopic organism or agent that causes disease

(NOTE: All viruses are harmful and cause such diseases as equine influenza, common cold, rabies, foot and mouth disease. Viruses cannot be successfully treated with antibiotics.)

E. Antiseptic — Substance that kills or prevents the growth of disease-producing microorganisms; may be applied to living tissues of animals

F. Disinfectant — Product that kills disease-producing microorganisms and thus prevents infection; applied to inanimate objects in animal's environment, such as buildings and equipment

G. Pharmaceuticals — Drugs used for treatment of disease or infection

EXAMPLES: Antibiotics, sulfa compounds, nitrofurans, steroids, hormones

H. Biologicals — Drugs used to prevent disease

EXAMPLES: All types of vaccines, including those to prevent blackleg, leptospirosis, erysipelas, and tetanus

I. Immunity — Ability to resist or overcome infection

J. Vaccine — Preparation of killed or weakened microorganisms or viral agents introduced into animal's system to produce immunity against a specific disease

K. Inoculation — Process of immunizing or vaccinating an animal by injecting a serum or vaccine into the animal in order to create an immunity

L. Bloat — Abnormal condition in ruminants characterized by swelling of the rumen due to an accumulation of gases; usually seen on animal's upper left side

INFORMATION SHEET

M. Bolus — Mass of food or medicine usually given orally with an instrument called a *balling gun*

N. Aqueous — Of, like, or containing water; watery

O. Suppository — Medicated substance introduced into a body passage where it is melted and diffused by body temperature

II. Signs of a healthy animal

A. Contentment

B. Alertness

C. Aggressive appetite

D. Sleek hair and smooth, pliable skin

E. Bright eyes and pink eye membranes

F. Normal feces and urine

(NOTE: Fecal consistency varies with the animal's diet. For instance, when animals are first turned out on lush grass, their feces will be loose. Consistency and dryness of the feces also vary among species, but should always be firm and not dry, and should not contain large amounts of undigested feed. Urine should be clear, and both feces and urine should be passed without effort, and should be free of blood, mucus, or pus.)

G. Normal temperature, pulse rate, and breathing rate (See Table I)

H. Alert, normal ear set

(NOTE: Alert ears are not a good indicator of health for some species, such as the Brahman and Brahman crossbreeds because their ears are normally drooped.)

III. Signs of an unhealthy animal

A. Lack of appetite or failure of young animals to nurse

(NOTE: The mother of a nursing animal should be routinely checked throughout the entire nursing period. If her teats are clean and sleek, the young has been nursing. If her udder is full, her young has not been nursing.)

B. Listlessness

C. Abnormal feces or urine

D. Abnormal discharge from nose, mouth, or eyes

INFORMATION SHEET

E. Unusual posture

EXAMPLES: Standing with head down, extreme nervousness

F. Persistent rubbing or licking

G. Dull hair and dry, scruffy skin

H. Pale or red or purple mucous membranes lining eyes or gums

I. Reluctance to move or unusual movements

J. Higher than normal temperature

K. Labored breathing—increased rate and depth

L. Altered social behavior

EXAMPLE: Leaving the herd and going off alone

M. Sudden drop in production

EXAMPLES: Drop in weight gains, milk production, wool production, or work

N. Ruminants not chewing their cuds

IV. Normal temperature, pulse rate, and breathing rate of common farm animals (Table 1)

TABLE 1: Normal temperature and pulse and breathing rates of common farm animals

Animal	Rectal temperature in degrees Fahrenheit		Pulse rate per minute	Breathing rate per minute
	Average	Range		
Cattle	101.5	100.4 to 102.8	60 to 70	10 to 30
Sheep	102.3	100.9 to 103.8	70 to 80	12 to 20
Goats	103.8	101.7 to 105.3	70 to 80	12 to 20
Swine	102.6	102.0 to 103.6	60 to 80	8 to 13
Horses	100.5	99.0 to 100.8	32 to 44	8 to 16

INFORMATION SHEET

V. Factors to consider when developing a program for preventing ill health in animals

(NOTE: The method of operation for the health plan should be written out in detail, and should include a calendar itemizing procedures and dates when they should be performed. To make the program practical, it should be coordinated with the routine handling of livestock.)

A. Keep a complete set of records on each animal

(NOTE: Oklahoma State University issues a herd production calendar on which to keep records on beef and sheep.)

EXAMPLES: Animal numbers; birthdates; immunizations; breeding and reproductive information such as heats, breedings, births, sex, birthweights, weaning weights of offspring; history of animal's sickness and treatments

B. Develop a closed herd of females as soon as possible

(NOTE: A closed herd helps eliminate problems associated with introduced reproductive diseases and failures. If outside females are brought in, they should be virgin animals that are healthy and sound.)

C. Obtain semen-tested virgin sires from known healthy herds

(NOTE: Semen evaluation and breeding soundness examinations should be performed yearly on sires, preferably just before breeding season.)

D. Plan a preventive medicine schedule for all diseases and parasites for which protection is needed

(NOTE: The schedule should include dates, initial doses, and when boosters are given. Immunizations and surgical procedures of offspring should be incorporated into the program also.)

E. Institute and maintain a comprehensive sanitation program

EXAMPLES: Provide animals with clean, dry, well-ventilated housing; use antiseptics and disinfectants; dispose of waste and dead animals properly.

F. Conduct yearly physical examinations of brood stock

EXAMPLES: Examination of eyes for diseases or growths, teeth for wear or breakage, feet for disease or damage and possible trimming or repair; treat for internal and external parasites; perform reproductive tract and pregnancy examinations

INFORMATION SHEET

VI. Good management practices for maintaining animal health

(NOTE: Biological agents and pharmaceuticals should not be relied upon as the sole basis of an animal health program. A good livestock producer can use the factors below to reduce the chances of introducing infectious diseases into a herd or flock.)

A. Purchase animals from reputable producers

B. Ask producer for appropriate health papers, and be sure to ask questions that might uncover health problems

EXAMPLES: Ask to see production records and reproductive records; ask about the disease program being followed; ask to look at the entire herd in addition to the animal being purchased.

C. Isolate newly purchased animals for a suitable length of time before exposing them to or adding them to your herd

D. Maintain a comprehensive sanitation program

E. Control outside traffic, both people and vehicles

(NOTE: Make sure that shipping and receiving areas are separate from the normal environment of your existing animals.)

F. Provide coveralls and boots for outsiders entering your buildings, lots, and pastures

(NOTE: Having visitors step in disinfectant foot baths before entering livestock buildings is a good practice.)

G. Control birds, rodents, and stray animals

H. Maintain adequate fencing

(NOTE: Double fence along line fences between your herd and a poorly managed neighboring herd.)

I. Dispose of dead animals promptly and properly

(NOTE: Bury them, burn them, or hire the services of a dead-animal disposal service.)

J. Establish a method of identifying animals that are sick or have been treated

(NOTE: Animals that are sick or are being treated should be isolated from the rest of the herd.)

EXAMPLES: Ear tags, spray paint, chalk marks

K. Plan location of buildings and lots to protect from neighbor's livestock drainage during wet periods

INFORMATION SHEET

VII. Major shelter requirements of livestock

(NOTE: Appropriate and adequate shelter requirements should be met for proper management and the maintenance of a healthy environment for various livestock. The considerations below should be of primary concern to serious livestock producers.)

A. Proper environmental conditions

EXAMPLES: Proper ventilation, proper humidity, maintenance of acceptable temperature through appropriate insulation, appropriate environment for newborn animals

B. Affordable design, construction, and maintenance costs

(NOTE: The producer should meet the needs of the livestock, but should ask "Can the livestock enterprise using the building pay for it before it is worn out?" Often fancy or elaborate buildings are not sound investments. The producer should also be as flexible as possible in design, bearing in mind that the facility may need to be adapted or changed if the enterprise is changed.)

C. Convenience

EXAMPLES: Shelter space constructed to keep labor to a minimum, designed for easy cleaning and manure handling, or for ease of maintaining sanitation

D. Durability

EXAMPLES: Built to withstand wind strains or roof snow

E. Dryness

EXAMPLES: Located to provide for rain drainage away from building; built to facilitate drainage of animal urine and cleaning water

F. Adequate lighting

EXAMPLES: Built to maximize use of natural light and to provide adequate artificial light

G. Safety

EXAMPLES: Appropriately designed for animal use of alleys and doors and for minimum fire risk

H. Adequate space

EXAMPLES: Adequate space allowed for operators to work, for feed and bedding storage, and for species of animal sheltered (See Table 2 on the next page for space requirements for common species.)

INFORMATION SHEET

TABLE 2: Space requirements for common species of farm animals

Species	Square foot requirements
Mature cattle (herd bulls and cows in maternity)	100 to 150
Other cattle (shelter only)	30 to 50
Mature sheep (stud rams and ewes with lambs)	20 to 30
Feeder lambs (shelter only)	6
Dry ewes (shelter only)	16
Sows, gilts before farrowing, and herd boars	15 to 20
Sows with pigs	45 to 60
Growing finishing hogs	5 to 10
Horses (stalls)	100 to 150

I. Rodent control

(NOTE: It is especially important to keep rodents away from feed and bedding materials because of the possible spread of disease.)

J. Convenient location to adjacent structures

EXAMPLES: Structure should be located near suitable corrals, lots, pens, and so forth.

K. Attractiveness

(NOTE: The structure should fit in well with the rest of the farmstead and be pleasant and acceptable to the humans living on the farmstead.)

VIII. Types of disinfectants and antiseptics

(NOTE: Always follow directions for the use of antiseptics and disinfectants. Too little will not kill the microorganisms, and too much can result in a buildup of toxic materials. After disinfecting feeding and watering equipment, rinse them before they are used again. Consult your local supplier about the selection of products for your particular needs.)

A. Disinfectants

1. *Sodium hydroxide* — Widely used as a germicide for milking equipment, and in stronger solutions used to kill the more resistant bacteria and viruses such as anthrax bacillus and hog cholera virus on floors, stalls, and pens

INFORMATION SHEET

2. *Unslaked lime* — Used with water to form calcium hydroxide, which is used as a whitewash on walls, floors, and certain types of equipment; also used to cover carcasses when burying them

3. *Acetic acid and lactic acid* — Used as preservatives for food and feed because they prohibit the growth of many microorganisms

4. *Phenol (carbolic acid)* — Considered one of the most efficient disinfectants, but too expensive and toxic for general use

5. *Orthophenylphenol* — Odorless disinfectant frequently used around dairy barns; also effective against tubercular organisms

6. *Chlorine* — Used to sterilize water supplies, dairy equipment, dishes, and glassware; readily destroyed by organic material

7. *Quaternary ammonium compounds* — Used as an equipment rinse and spray disinfectant against non-spore-forming bacteria

8. *Chlorhexidene (Nolvasan)* — Used as a bath in which to soak instruments between their use on successive animals

B. Antiseptics

1. *Iodine* — Used very effectively on the skin; also makes an excellent wash in which to soak instruments between their use on successive animals

   (NOTE: As an antiseptic, use 2 percent or 7 percent solution in alcohol tincture.)

2. *Ethanol* — Used in ethyl rubbing alcohol (70 percent by weight) but not very effective as an antimicrobial drug

3. *Isopropanol* — Used in isopropyl rubbing alcohol (70 percent by weight) and slightly more germicidal than ethanol in its pure form; causes dilation of blood vessels, thereby creating a greater tendency for bleeding

4. *Hydrogen peroxide* — Oxidizing agent available in 3 percent aqueous solution for washing and cleansing wounds

5. *Potassium permanganate* — Used in conjunction with formaldehyde to fumigate buildings

C. Cleansers

1. *Detergents, wetting agents, emulsifiers* — Agents used extensively because of their nontoxicity to living tissues

2. *Soaps* — Used to remove oily compounds, organic matter, and bacteria from the skin

INFORMATION SHEET

IX. Factors to consider in disinfecting livestock facilities

(NOTE: A high concentration of animals and continuous use of facilities result in "disease buildup." As various organisms—bacteria, fungi, parasite eggs—accumulate, disease problems become more severe and diseases can be transmitted to succeeding groups of animals raised in those facilities. Facilities must be disinfected in the case of a disease breakout; however, the facility must be thoroughly cleaned *before* the application of disinfectant.)

A. Killing strength of disinfectant

(NOTE: The killing strength of a disinfectant is expressed as a "phenol coefficient.")

B. Dilution at which disinfectant is used

(NOTE: In order to retain the killing strength of the disinfectant, the product must be properly diluted with water. Too much water weakens the disinfectant's killing strength.)

C. Temperature of disinfectant

(NOTE: Most disinfectants are at peak effectiveness when applied hot.)

D. Thoroughness of application and length of time before letting animals back in building (time of exposure)

X. Descriptions of methods of administering medicine

(NOTE: When administering medicine to livestock, always take proper precautions to restrain the animal, both for its safety and your own. Also, never administer a medication without first having read all of the label literature and cautions. A mistake in type of medication or amount could cost you an animal.)

A. Topical — Applied to skin or mucous membranes of eye, ear, or nasal passage

EXAMPLES: Ointments, aqueous solutions, powders, aerosols

(NOTE: Remember, absorption occurs when the medicine is applied topically. Make sure that the medicine is nontoxic.)

B. Oral — Given by mouth by feeding, balling gun, drench applicator (gun), or dose syringe

EXAMPLES: Pills, tablets, capsules, liquids

C. Anal or rectal — Introduced into rectum

EXAMPLE: Suppository

D. Nasal — Introduced into nose

EXAMPLE: Spray for hogs or calves with respiratory virus

E. Injectable — Placed directly into animal's body with needle and syringe

EXAMPLES: Intravenous, intramuscular, intradermal

F. Intrauterine — Introduced directly into uterus

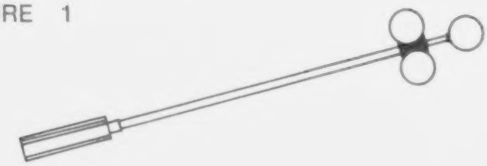
EXAMPLE: Bolus placed in uterus after calving problems

XI. Equipment used to administer medications and to monitor health care of livestock (Figures 1-10)

(NOTE: Dip equipment in a disinfectant solution between use on different animals. Also, use care when placing equipment or medication in an animal's mouth. You do not want to be bitten, and you do not want to allow the equipment or medication to enter the animal's lungs. Proceed slowly, allowing the animal plenty of time to swallow.)

A. Balling gun — Used to administer pills, capsules, or boluses orally

FIGURE 1



B. Syringe — Used with needle to administer liquid injectables

(NOTE: There are many types of syringes, and needles come in a variety of diameters and lengths. Remember: the smaller the needle's gauge number, the larger the needle's diameter. Twenty-two-gauge, 1-inch and 18-gauge, 1 ½-inch needles are suitable for most injections.)

FIGURE 2: Multidose

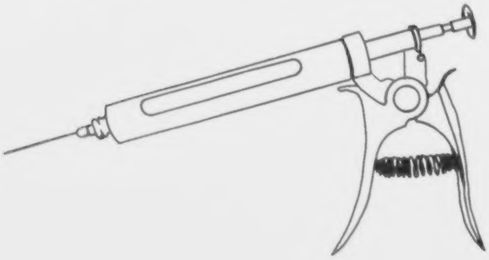
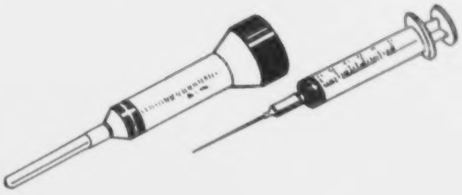


FIGURE 3: Single-dose disposable



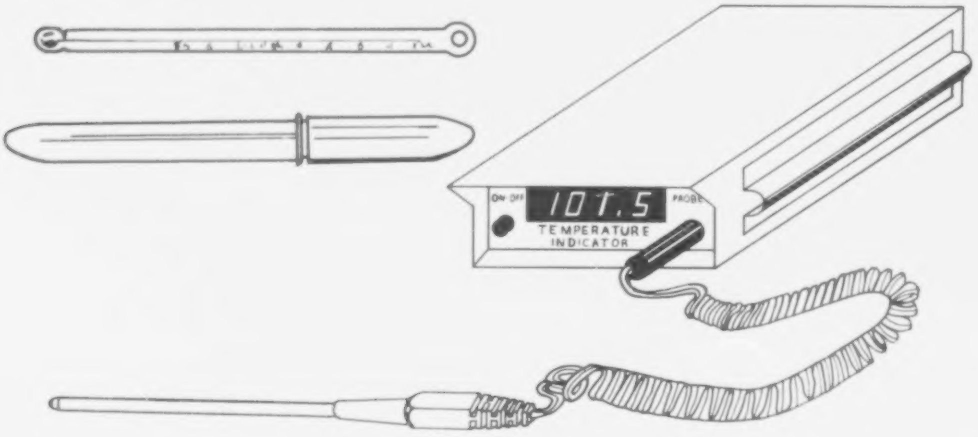
INFORMATION SHEET

C. Thermometer — Inserted into animal's rectum to check body temperature

(NOTE: A number of types of animal thermometers are available, including digital instant read-out models such as that shown in Figure 5. While the digital models are much more expensive than the common lineal models, they are worth the expense when checking many animals or a herd.)

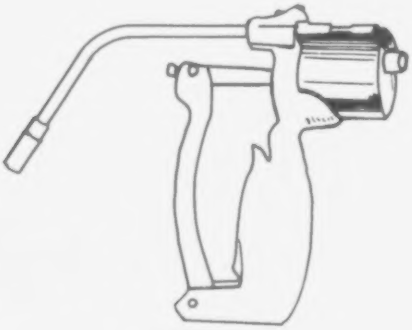
FIGURE 4: Lineal animal thermometer

FIGURE 5: Digital animal thermometer



D. Drench gun — Used to administer orally liquid medications measured in cubic centimeters or ounces

FIGURE 6

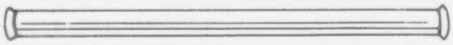


INFORMATION SHEET

E. Speculum tube — Twenty-inch metal tube used with a rubber tube to relieve cattle of bloat

(NOTE: The speculum tube is placed in the animal's mouth and esophagus, and the rubber hose is passed through the tube into the animal's stomach. This method of bloat treatment should be attempted only after observation and instruction in correct procedures.)

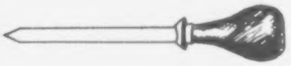
FIGURE 7



F. Trocar and cannula — Two-part device used to relieve bloat in cattle and sheep; when trocar is withdrawn, the cannula (hollow tube) is left to allow gas to escape

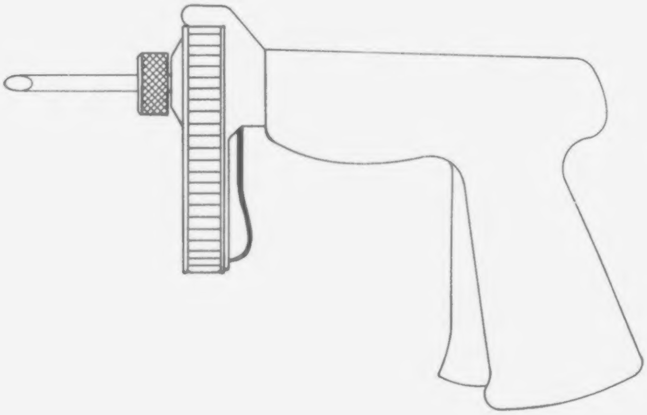
(NOTE: Like the speculum tube, this equipment should be used only after observation and instruction in correct procedures, and, more importantly, only after all other bloat relief methods have been unsuccessful. After the trocar and cannula have been used, a veterinarian should be consulted for postbloat treatment.)

FIGURE 8



G. Implant gun — Used to deposit growth stimulant pellets in back of ear

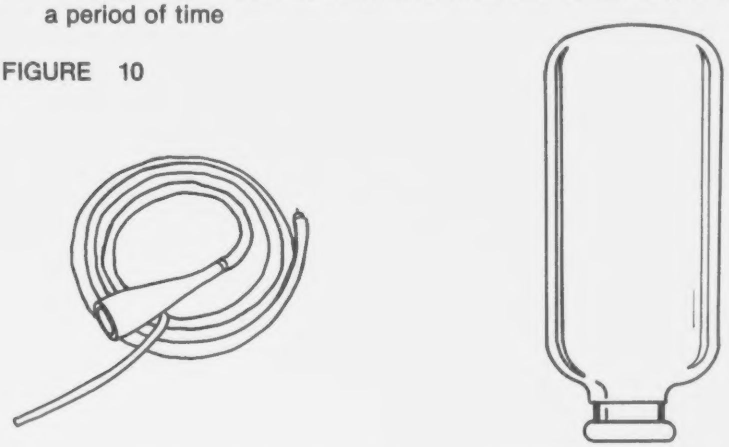
FIGURE 9



INFORMATION SHEET

H. IV equipment — Used to administer medicine continually or intermittently over a period of time

FIGURE 10



XII. Injection sites, methods, and descriptions (Figures 11-17)

A. Subcutaneous injection (Sub Q) — Made in any area where skin fits loosely, such as neck, chest wall, or flank; dosage is deposited under raised skin, and area is then massaged to facilitate distribution

FIGURE 11

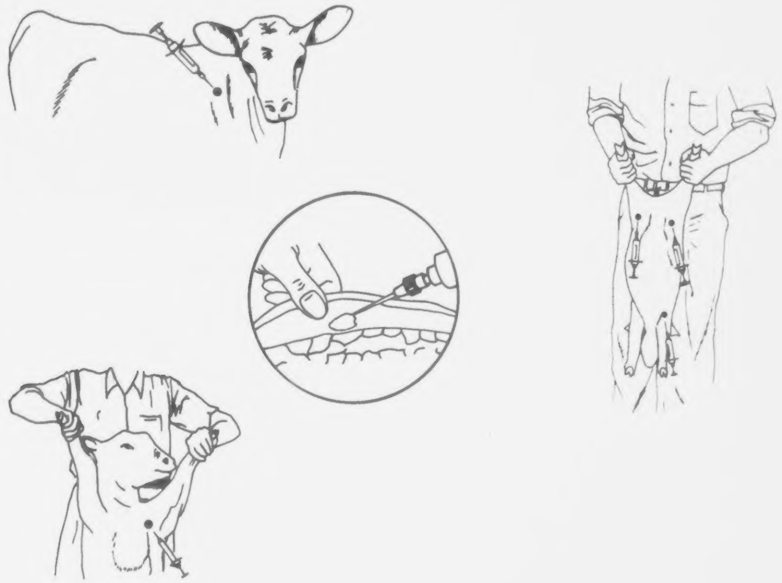
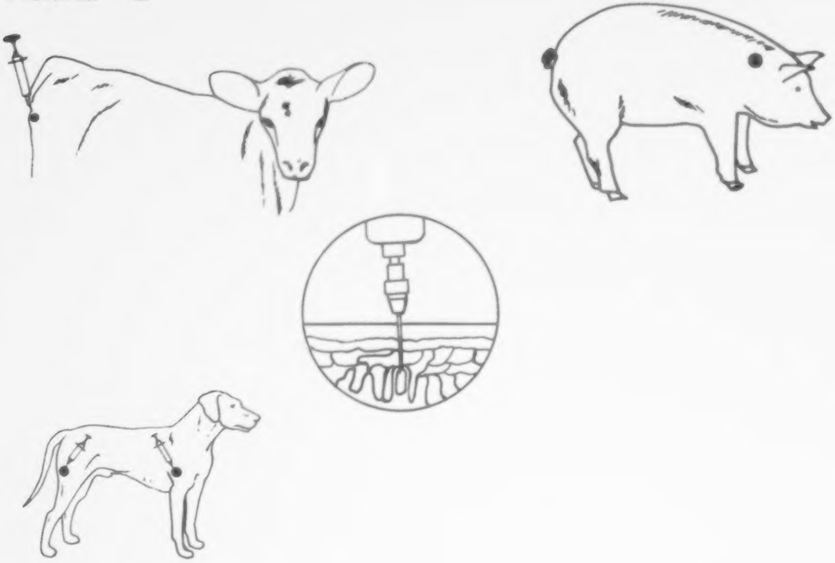


Figure 11 adapted with permission of ANCHOR DIVISION, Boehringer Ingelheim Animal Health, Inc.

INFORMATION SHEET

B. Intramuscular injection (IM) — Made deeply into large muscle with needle at least 3/4 inch long

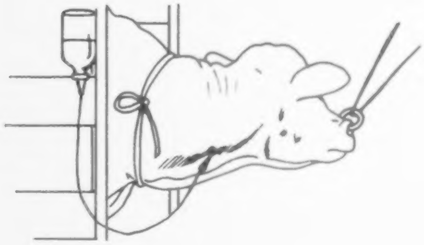
FIGURE 12



C. Intravenous (IV) injection in cattle — Made directly into jugular vein with 14- or 16- gauge, 1 1/2- to 2-inch needle with point toward animal's heart

(NOTE: Apply a choke rope to raise the vein so that the needle can be inserted correctly. Be sure that blood flows freely from the needle, and then release the choke rope and attach the syringe or IV tube to the needle to administer medication. Monitor constantly to make sure that the needle remains in the vein.)

FIGURE 13



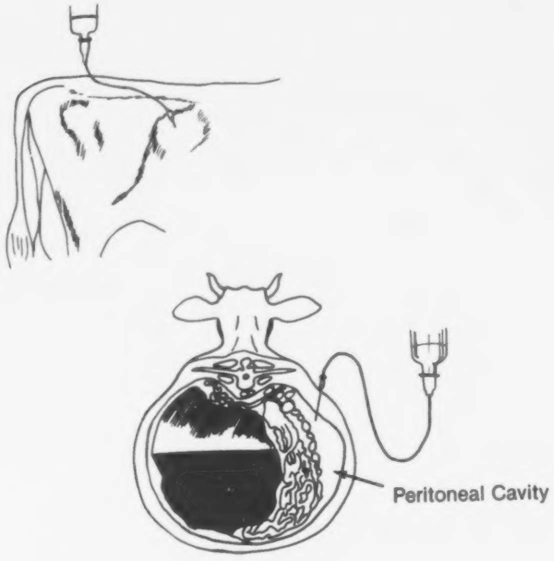
Figures 12 and 13 adapted with permission of ANCHOR DIVISION, Boehringer Ingelheim Animal Health, Inc.

INFORMATION SHEET

D. Intraperitoneal injection (IP) in cattle — Made into right flank at point in center of triangle formed by loin, last rib, and line from top of last rib to hip bone

(NOTE: This type of injection is not recommended for horses. Use sterile precautions, a 14- to 16-gauge, 2 ½- to 3-inch needle, and warm solution to body temperature before administering.)

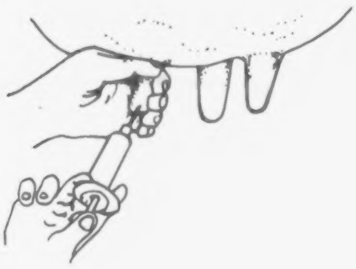
FIGURE 14



E. Infusion intramammary (IMM) — Made with cannula directly into teat canal after disinfecting teat and depressing teat to open sphincter muscle

(NOTE: The teat should be disinfected again after the infusion.)

FIGURE 15



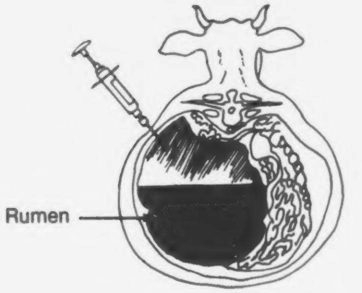
Figures 14 and 15 adapted with permission of ANCHOR DIVISION, Boehringer Ingelheim Animal Health, Inc.

INFORMATION SHEET

F. Intraruminal injection (IR) — Made through left flank with 14-gauge, 3-inch needle

(NOTE: Intraruminal injection is performed to relieve bloat. The needle has been inserted correctly if gas or liquid from the stomach returns through the needle.)

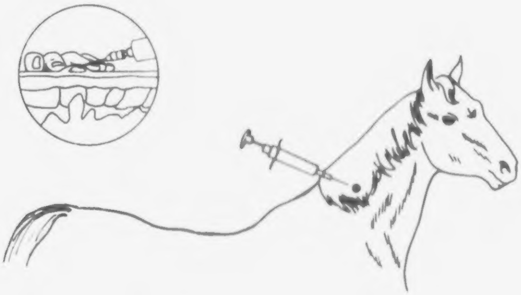
FIGURE 16



G. Intradermal injection (ID) — Made into skin with 20- to 26-gauge needle

(NOTE: An intradermal injection should raise a blister. Shave the animal's hair prior to injection.)

FIGURE 17



Figures 16 and 17 adapted with permission of ANCHOR DIVISION, Boehringer Ingelheim Animal Health, Inc.

XIII. Guidelines for proper vaccination of livestock

A. Use a syringe that is clean and in good working order

(NOTE: Dismantle syringes and boil or chemically sterilize after use.)

B. Use only the dose directed; do not overdose or underdose

INFORMATION SHEET

C. Inject by proper route and use proper method

D. Keep vaccine bottles refrigerated before, during, and after use

(NOTE: Throw away any vaccine bottles left unrefrigerated.)

E. Do not expose live biologicals to sunlight

F. Do not vaccinate meat-producing animals within twenty-one days of slaughter

G. Never stab or inject in primal cuts; use shoulder or neck muscles

H. Ensure that immunity will develop after vaccination by making sure that animal is healthy when vaccinated, administering vaccine correctly, and allowing proper time to observe negative reactions from vaccine

I. Change needles for each animal when anaplasmosis may be a problem in the herd

(NOTE: Anaplasmosis is a disease caused by parasites that infect cattle.)

MAINTAIN ANIMAL HEALTH
UNIT II

ASSIGNMENT SHEET #1 — SELECT METHODS, EQUIPMENT, AND LOCATIONS FOR ADMINISTERING MEDICINE

NAME ______________________________ SCORE ______________

As a livestock producer, you have the responsibility to administer medicines and vaccines to maintain animal health. Review Sections X through XIII of the Information Sheet, and then complete the following assignment.

PART I

A. You are to administer noninjectable liquid worm medicine to sheep—

What method of administration would you use? ______________________

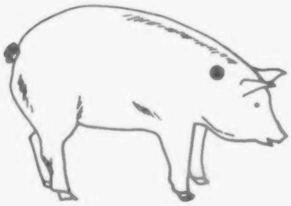
What equipment would you use? ______________________

B. You are to give intramuscular iron to baby pigs—

What method of administration would you use? ______________________

What equipment would you use? ______________________

Which of the sites below would you use? (Write the correct number.) ______________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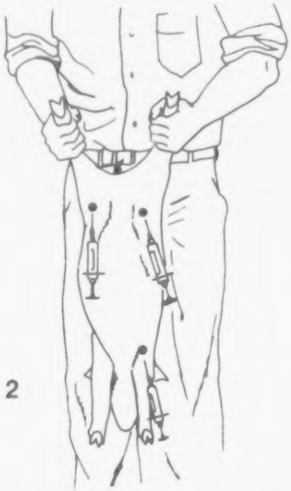
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C. What method of administration would you use to treat cattle with a liquid, pour-on lice control medication?

____

ASSIGNMENT SHEET #1

D. You are to administer worm medicine boluses to cattle—

What method of administration would you use? ________________________________

What equipment would you need? ________________________________

E. You must administer growth stimulants to a group of stocker cattle—

What method of administration would you use? ________________________________

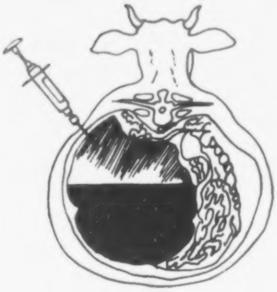
What equipment would you need? ________________________________

What administration site would you choose? ________________________________

PART II

Choose the picture from each of the following groups that best illustrates the injection method listed. Circle the correct numbers.

A. Intraruminal



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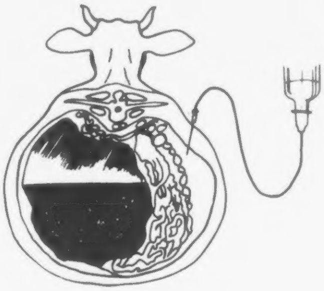

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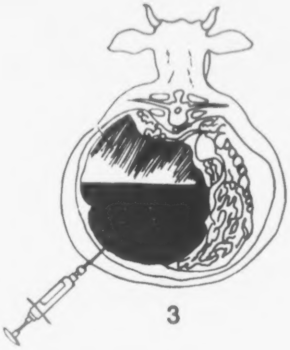

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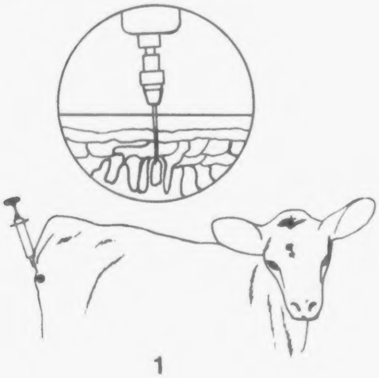
B. Subcutaneous



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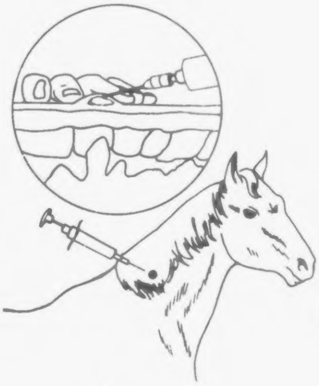

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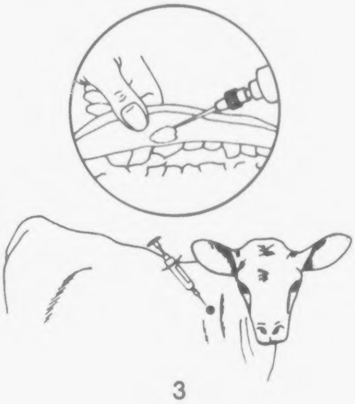

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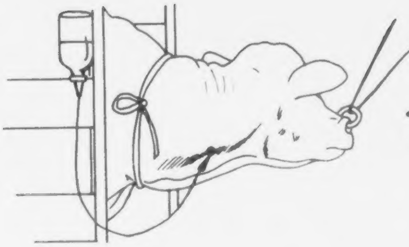
ASSIGNMENT SHEET #1

C. Intraperitoneal



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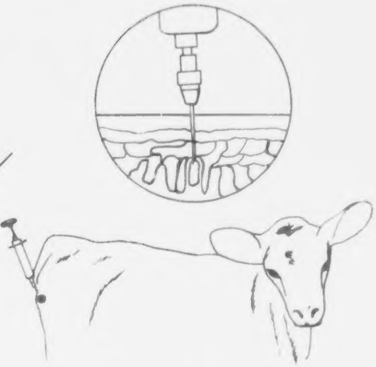

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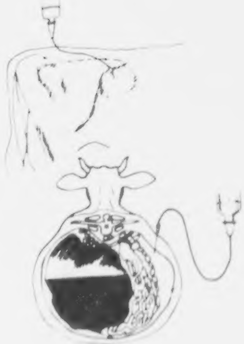

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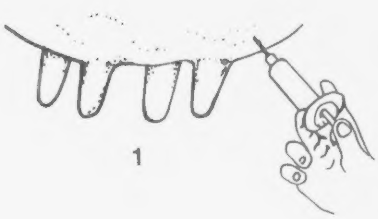
D. Infusion intramammary



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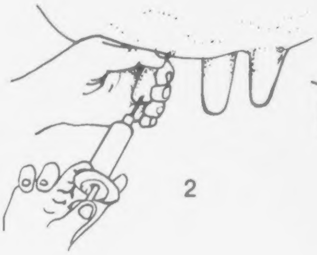

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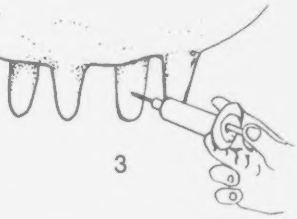

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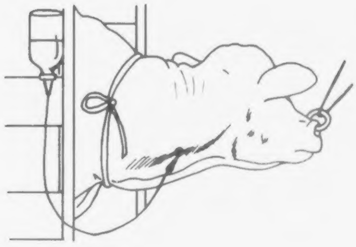
E. Intravenous



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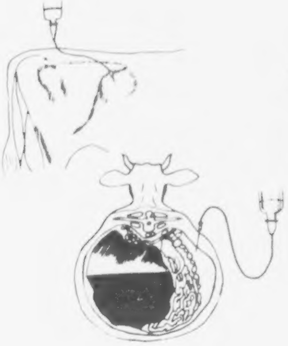

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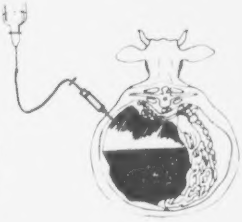

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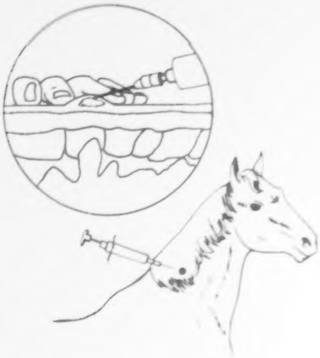
ASSIGNMENT SHEET #1

F. Intradermal



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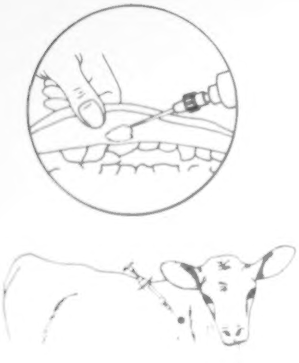

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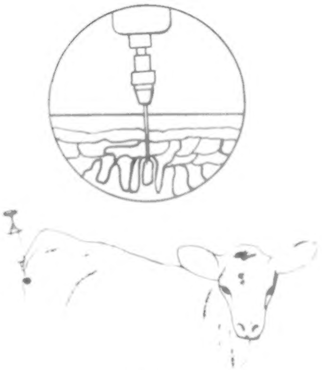

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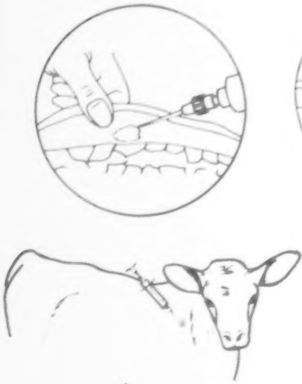
G. Intramuscular



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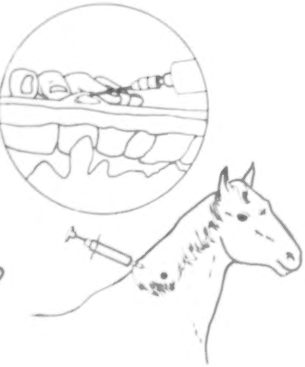

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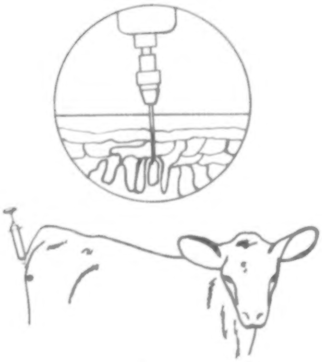

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All figures used in Assignment Sheet #1 adapted with permission of ANCHOR DIVISION, Boehringer Ingelheim Animal Health, Inc.

MAINTAIN ANIMAL HEALTH
UNIT II

ANSWERS TO ASSIGNMENT SHEET

Assignment Sheet #1

PART I

A. Oral, drench gun

B. Injectable, syringe and needle, 1

C. Topical

D. Oral, balling gun

E. Subcutaneous injection, implant gun, back of ear

PART II

A. 1

B. 3

C. 3

D. 2

E. 1

F. 1

G. 3

MAINTAIN ANIMAL HEALTH
UNIT II

JOB SHEET #1 — FILL A SYRINGE

I. Equipment and materials

A. Sterile, large-diameter needle

(NOTE: A large-diameter needle is used for this exercise because many drugs thicken when refrigerated and a large-diameter needle is helpful for filling the syringe with the thickened drug.)

B. Clean syringe

C. Antiseptic and cotton ball or swab with which to apply it

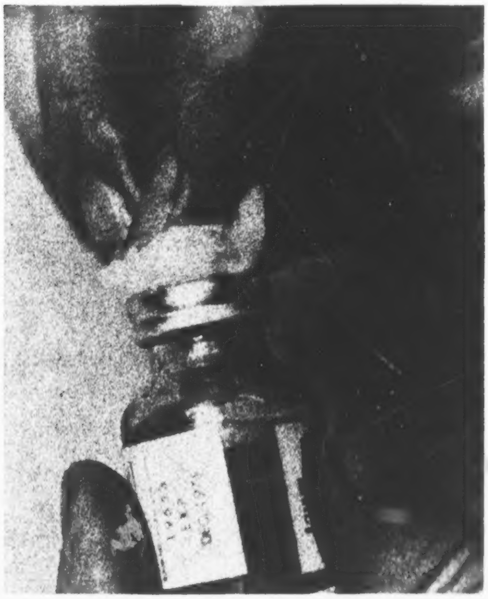
D. Medicine vial

II. Procedure

A. Fit needle to syringe by inserting tip of syringe into needle hub and twisting clockwise to ensure a snug fit

B. Cleanse rubber stopper of medicine vial with antiseptic (Figure 18)

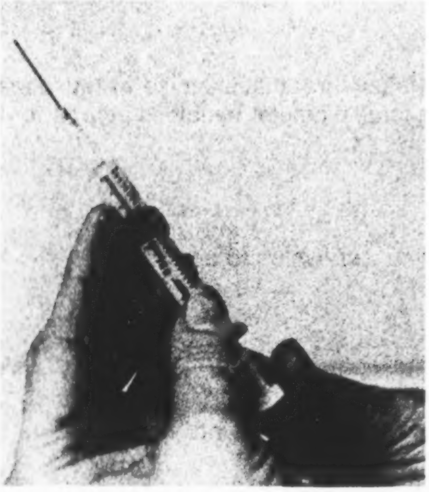
FIGURE 18



JOB SHEET #1

C. Pull back on plunger to fill syringe with amount of air equal to desired dosage (Figure 19)

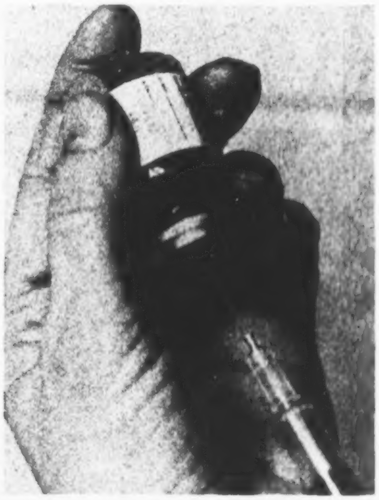
FIGURE 19



D. Pass needle through rubber stopper of medicine vial and slowly inject air into bottle

E. Invert vial and withdraw dosage, making sure that needle is in solution (Figure 20)

FIGURE 20

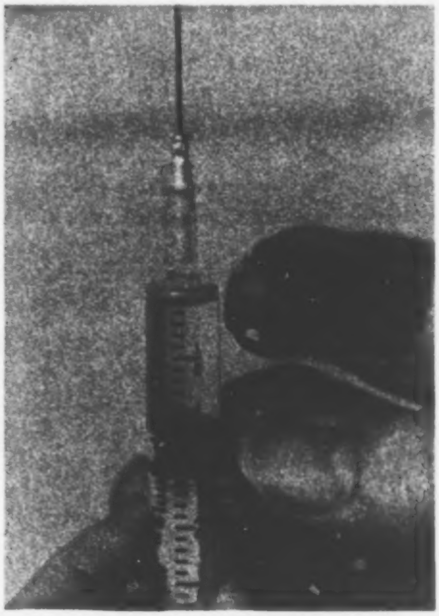


JOB SHEET #1

F. Withdraw needle from rubber stopper by pulling straight out

G. Remove any air bubbles from syringe by holding it upright, tapping on it gently with your finger, and pushing plunger upward to expel a drop or two of medication (Figure 21)

FIGURE 21



H. Hold syringe and plunger in a manner that will not allow spillage or contamination of needle

(NOTE: The syringe is now filled, and you are ready to inject the animal. The syringe and needle should be used now and should never be laid down or set aside because of the possibility of contamination.)

I. Clean work area and store equipment and materials properly

MAINTAIN ANIMAL HEALTH
UNIT II

JOB SHEET #2 — TAKE AN ANIMAL'S TEMPERATURE

I. Equipment and materials

A. Means of restraint

B. Animal

(NOTE: A horse is used in this job sheet for demonstration purposes. The procedure would be performed in a similar manner on other animals also.)

C. Veterinary thermometer

D. Wrapping string

E. Alligator clip

F. Watch with sweep second hand

G. Nonirritating lubricant such as petroleum jelly

H. Antiseptic and sterile cotton balls or swab with which to apply it

II. Procedure

A. Attach a 10- to 12-inch length of wrapping string to loop on end of thermometer

B. Attach an alligator clip to other end of string

(NOTE: Attaching a string and clip to the thermometer allows it to be inserted and then clipped to the tail hairs. Also, the thermometer can be retrieved if it is expelled or if it is pulled into the rectum.)

C. Shake down thermometer so that it reads below 96°F

D. Coat thermometer with lubricant to allow for smooth insertion into rectum

(NOTE: A dry thermometer will adhere to the anus and cause irritation.)

E. Restrain the animal

F. Approach animal's side and work rearward until you are standing next to its hip

(NOTE: Most animals, and particularly horses, should not be approached from directly behind; nor should you stand directly behind a horse once you are next to it.)

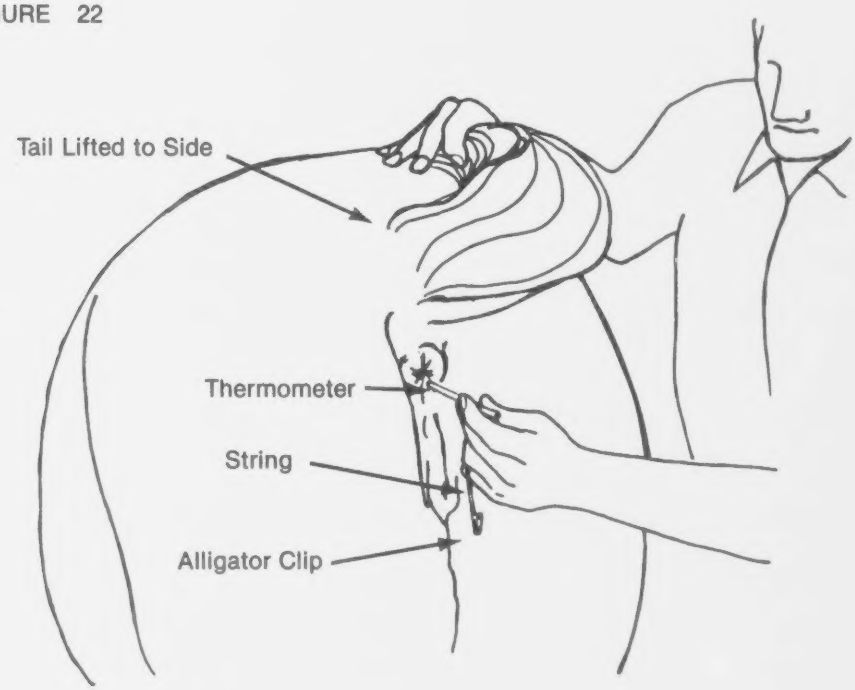
JOB SHEET #2

G. Raise animal's tail and pull or push it to one side to expose rectum

> **CAUTION**
>
> Do not attempt to lift the animal's tail straight up. It is uncomfortable for most animals and will certainly provoke resistance.

H. Insert thermometer into rectum with a slight rotating motion, pushing thermometer in until only about 1 to 1 ½ inches of the barrel is outside the rectum (Figure 22)

FIGURE 22



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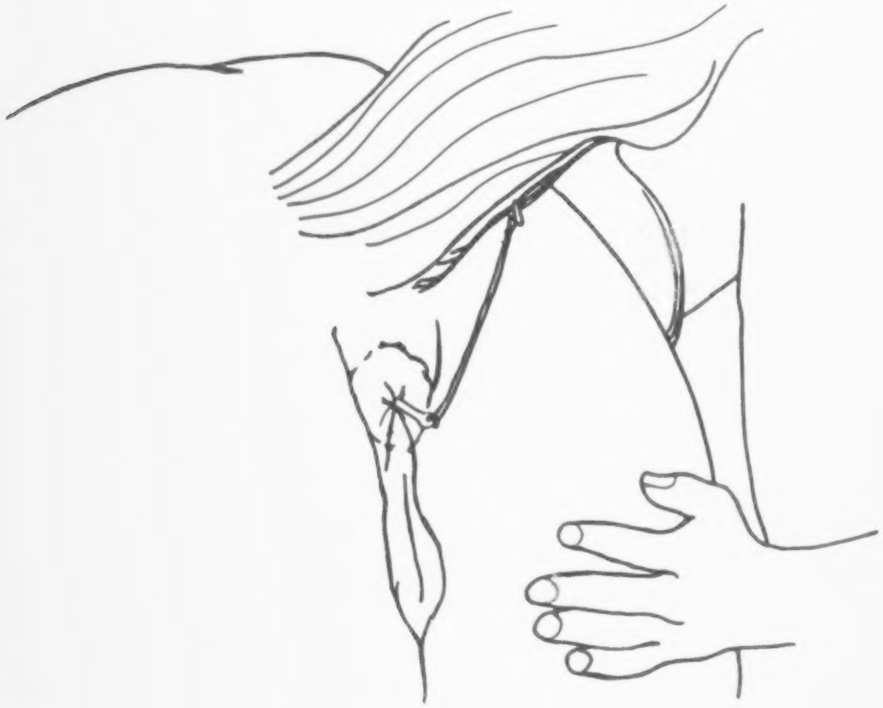
JOB SHEET #2

I. Attach clip to a clump of tail hairs, and test attachment by tugging on clip (Figure 23)

FIGURE 23



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J. Allow thermometer to remain in animal for at least 2 to 3 minutes

(NOTE: The tail can be released once the thermometer is positioned.)

K. Remove thermometer by pulling on string

L. Read thermometer by wiping it clean and holding it so that the numbers are almost facing your chest; rotate it back and forth until you can see the mercury line and take your reading

M. Record your reading and release the animal

N. Disinfect thermometer with antiseptic and store equipment and materials properly

MAINTAIN ANIMAL HEALTH
UNIT II

JOB SHEET #3 — GIVE AN INTRAMUSCULAR INJECTION

I. Equipment and materials

   A. Sterile syringe with 16-gauge, 1-inch needle

   B. Weaning pig

   C. Antibiotic

   D. Means of restraint

   E. Antiseptic and sterile cotton balls or gauze 4×4 with which to apply it

II. Procedure

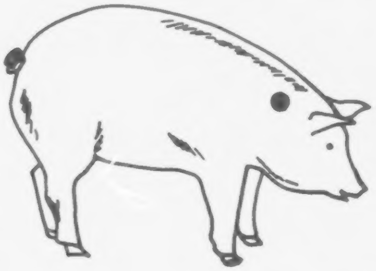
   A. Read all label directions and cautions on antibiotic

   B. Attach needle to syringe if necessary

   C. Restrain animal

   D. Cleanse injection site with antiseptic (Figure 24)

FIGURE 24

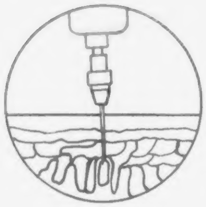


   E. Draw recommended amount of antibiotic into syringe (Job Sheet #1)

   F. Insert needle its full length into injection site, and discharge dosage (See Figure 25)

JOB SHEET #3

FIGURE 25



Adapted with permission of ANCHOR DIVISION, Boehringer Ingelheim Animal Health, Inc.

G. Withdraw needle, and massage injection site to distribute antibiotic

H. Release animal, sterilize syringe and needle, and store equipment and materials properly

MAINTAIN ANIMAL HEALTH
UNIT II

JOB SHEET #4 — GIVE A SUBCUTANEOUS INJECTION

I. Equipment and materials

A. Sterile syringe with 16-gauge, $\frac{3}{4}$-inch needle

B. Calf

C. Blackleg vaccine

D. Means of restraint

E. Antiseptic and sterile cotton balls or gauze 4×4 with which to apply it

II. Procedure

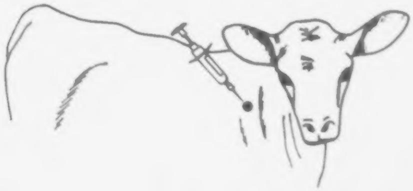
A. Read all label directions and cautions on blackleg vaccine

B. Attach needle to syringe if necessary

C. Restrain animal

D. Cleanse injection site with antiseptic (Figure 26)

FIGURE 26



Adapted with permission of ANCHOR DIVISION, Boehringer Ingelheim Animal Health, Inc.

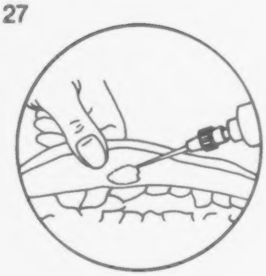
E. Draw recommended amount of vaccine into syringe (Job Sheet #1)

F. Pick up animal's skin at injection site, insert needle *between* skin and muscle, and discharge dosage (See Figure 27)

(NOTE: Make sure that dosage is deposited between skin and muscle; otherwise, the medication will form a knot at the injection site and will not be absorbed.)

JOB SHEET #4

FIGURE 27



Adapted with permission of ANCHOR DIVISION, Boehringer Ingelheim Animal Health, Inc.

G. Withdraw needle, and massage injection site to distribute vaccine

H. Release animal, sterilize syringe and needle, and store equipment and materials properly

MAINTAIN ANIMAL HEALTH
UNIT II

JOB SHEET #5 — ADMINISTER GROWTH STIMULANT IMPLANTS

I. Equipment and materials

  A. Implant gun and needle

  B. Implant pellets

  C. Calf or lamb

  D. Means of restraint

  E. Antiseptic and sterile cotton balls or gauze 4×4 with which to apply it

  F. Pipe cleaner

II. Procedure

(NOTE: When performing this procedure, try to avoid the following common implant errors: 1) gouging the cartilage of the ear, 2) implanting between layers of skin or into the muscle rather than between skin and muscle, and 3) piercing an ear vein and causing minor hemorrhage.)

  A. Read label directions and cautions on implant pellets

  B. Place implant cartridge into implant gun according to manufacturer's instructions

CAUTION

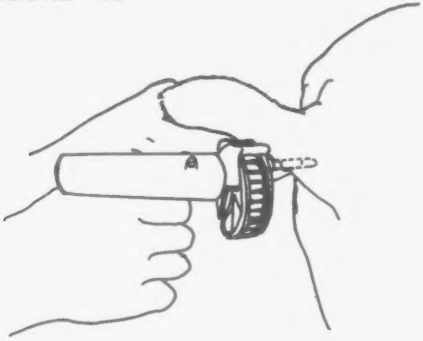
Make sure that cartridge is inserted properly. If pellets are forced out of the wrong side of the cartridge, they will be crushed. Crushed pellets are absorbed too rapidly, which may cause side effects and reduce the growth response.

  C. Choose a sharp needle and insert it into implant gun

  D. Determine which ear is to be implanted, and adjust needle and cartridge so that needle can be positioned next to and parallel to ear, with slant side of needle facing outward (See Figure 28)

JOB SHEET #5

FIGURE 28



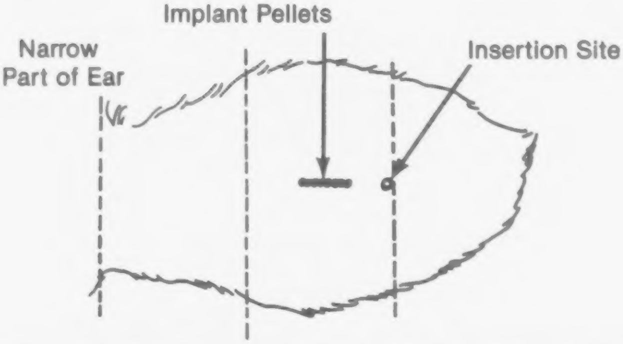
(NOTE: Implant all animals in the same ear to avoid confusion. When the animals are reimplanted, use the opposite ear. Be sure to record in your records the implant procedure and ear used.)

E. Restrain animal

F. Clean needle and implant site with antiseptic to reduce contamination of needle wound

(NOTE: Implants will be administered on the back middle third of the ear between the ridges of cartilage. See Figure 29.)

FIGURE 29



Figures 28 and 29 used with permission of Burgess Publishing Company, Minneapolis, Minnesota, CEPCO Division, from *Handbook of Livestock Management Techniques*, by Richard A. Battaglia and Vernon B. Mayrose, 1981.

G. Grasp and manipulate ear with one hand while using other hand to position implant gun parallel to and nearly flush with ear; make sure that tip of needle faces base of ear and that beveled part of needle faces up

H. Pick up skin at implant site with tip of needle or with your fingers

JOB SHEET #5

I. Keeping needle parallel to ear, insert needle under skin for its full length (Figure 30)

(NOTE: If you are not sure of the position of the needle tip, feel the point beneath the skin.)

CAUTION

When the ear is grasped and the needle inserted, the animal may throw its head and injure you or itself. Be sure to use proper restraint. If help is available, use an assistant for backup.

FIGURE 30

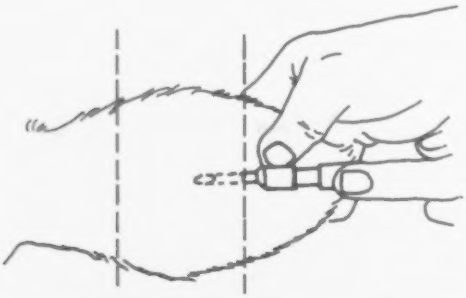


Figure 30 used with permission of Burgess Publishing Company, Minneapolis, Minnesota, CEPCO Division, from *Handbook of Livestock Management Techniques*, by Richard A. Battaglia and Vernon B. Mayrose, 1981.

J. Pull implant gun and needle back about 3/8 of an inch to create a space for the implant pellets to prevent crushing

K. Squeeze trigger and insert prescribed number of pellets according to label directions

CAUTION

Proper dosage is important. *Do not* take the attitude, "If a little is good, a lot is better."

L. Keep trigger depressed and gently withdraw needle

M. Feel ear for implants under skin; if implants are not felt, examine ear closely to determine whether pellets were inserted properly; reimplant only if pellets are not in ear

N. Release animal

O. Clean implant gun and disinfect needle with antiseptic; if inside of needle is filled with blood or crushed implant, clean with pipe cleaner

(NOTE: Heavy hair and thick skin will dull needles. Also, bumping the needle on the headgate or other object can cause a burr on the tip. A burr can be removed with a whetstone.)

P. Store equipment and materials properly

MAINTAIN ANIMAL HEALTH
UNIT II

TEST

NAME ____ SCORE ________________

1. Match to their correct definitions terms associated with maintaining animal health. Write the correct numbers in the blanks.

_____a. Drugs used to prevent disease

_____b. Tiny ultramicroscopic or submicroscopic organism or agent that causes disease

_____c. Physical well-being, freedom from disease, pain, or defect

_____d. Drugs used for treatment of disease or infection

_____e. Of, like, or containing water; watery

_____f. Mass of food or medicine usually given orally with an instrument called a *balling gun*

_____g. One-celled microorganisms that may be either harmful or beneficial and can be seen with a microscope

_____h. Any deviation of body from its normal healthy state

_____i. Product that kills disease-producing microorganisms and thus prevents infection; applied to inanimate objects in animal's environment, such as buildings and equipment

_____j. Abnormal condition in ruminants characterized by swelling of the rumen due to an accumulation of gases; usually seen on animal's upper left side

_____k. Process of immunizing or vaccinating an animal by injecting a serum or vaccine into the animal in order to create immunity

_____l. Preparation of killed or weakened microorganisms or viral agents introduced into animal's system to produce immunity against a specific disease

1. Health
2. Disease
3. Virus
4. Bacteria
5. Disinfectant
6. Antiseptic
7. Biologicals
8. Pharmaceuticals
9. Immunity
10. Inoculation
11. Vaccine
12. Bolus
13. Bloat
14. Aqueous
15. Suppository

TEST

______m. Medicated substance introduced into a body passage where it is melted and diffused by body temperature

______n. Ability to resist or overcome infection

______o. Substance that kills or prevents growth of disease-producing microorganisms; may be applied to living tissues of animals

2. List five signs of a healthy animal.

a. ____

b. ____

c. ____

d. ____

e. ____

3. List ten signs of an unhealthy animal.

a. ____

b. ____

c. ____

d. ____

e. ____

f. ____

g. ____

h. ____

i. ____

j. ____

TEST

4. Match common farm animals to their normal average temperature, pulse rate, and breathing rate. Write the correct numbers in the blanks.

_____a. 102.6°F *average rectal temperature*
60 to 80 *normal pulse rate*
8 to 13 *normal breathing rate*

_____b. 101.5°F *average rectal temperature*
60 to 70 *normal pulse rate*
10 to 30 *normal breathing rate*

_____c. 103.8°F *average rectal temperature*
70 to 80 *normal pulse rate*
12 to 20 *normal breathing rate*

_____d. 100.5°F *average rectal temperature*
32 to 44 *normal pulse rate*
8 to 16 *normal breathing rate*

_____e. 102.3°F *average rectal temperature*
70 to 80 *normal pulse rate*
12 to 20 *normal breathing rate*

1. Cattle
2. Sheep
3. Goats
4. Swine
5. Horses

5. Discuss factors to consider when developing a program for preventing ill health in animals.

6. Select from the following list good management practices for maintaining animal health. Write an "X" in the blank before each correct answer.

_____a. Purchase animals only from neighbors and relatives

_____b. Ask producer for appropriate health papers, and be sure to ask questions that might uncover health problems

_____c. Immediately integrate newly purchased animals into your herd

_____d. Control outside traffic, both people and vehicles

TEST

______e. Provide coveralls and boots for outsiders entering your buildings, lots, and pastures

______f. Control birds, rodents, and stray animals

______g. Triple fence between your herd and a poorly managed neighboring herd

______h. Dispose of dead animals promptly and properly

______i. Establish a method of disposing of animals that are sick or have been treated

______j. Plan location of buildings and lots to take advantage of neighbor's drainage during wet periods

______k. Maintain a comprehensive sanitation program

7. List eight major shelter requirements of livestock.

a. ____

b. ____

c. ____

d. ____

e. ____

f. ____

g. ____

h. ____

8. Match disinfectants and antiseptics to their correct uses/descriptions. Write the correct numbers in the blanks.

______a. Oxidizing agent available in 3 percent aqueous solution for washing and cleansing wounds

______b. Used as preservatives for food and feed because they prohibit the growth of many microorganisms

______c. Used to sterilize water supplies, dairy equipment, dishes, and glassware; readily destroyed by organic material

______d. Used in ethyl rubbing alcohol (70 percent by weight) but not very effective as an antimicrobial drug

Disinfectants

1. Sodium hydroxide
2. Unslaked lime
3. Acetic acid and lactic acid
4. Phenol (carbolic acid)

TEST

_____e. Used to remove oily compounds, organic matter, and bacteria from skin

_____f. Used in conjunction with formaldehyde to fumigate buildings

_____g. Used with water to form calcium hydroxide, which is used as a whitewash on walls, floors, and certain types of equipment; also used to cover carcasses when burying them

_____h. Used as an equipment rinse and spray disinfectant against non-spore-forming bacteria

_____i. Used very effectively on the skin; also makes an excellent wash in which to soak instruments between their use on successive animals

_____j. Agents used extensively because of their nontoxicity to living tissues

_____k. Considered one of the most efficient disinfectants, but too expensive and toxic for general use

_____l. Used as a bath in which to soak instruments between their use on successive animals

_____m. Used in isopropyl rubbing alcohol (70 percent by weight) and slightly more germicidal than ethanol in its pure form; causes dilation of the blood vessels, thereby creating a greater tendency for bleeding

_____n. Widely used as a germicide for milking equipment, and in stronger solutions used to kill the more resistant bacteria and viruses such as anthrax bacillus and hog cholera virus on floors, stalls, and pens

_____o. Odorless disinfectant frequently used around dairy barns; also effective against tubercular organisms

5. Orthophenylphenol
6. Chlorine
7. Quaternary ammonium compounds
8. Chlorhexidene (Nolvasan)

Antiseptics

9. Iodine
10. Ethanol
11. Isopropanol
12. Hydrogen peroxide
13. Potassium permanganate

Cleansers

14. Detergents, wetting agents, emulsifiers
15. Soaps

TEST

9. Select from the following list factors to consider in disinfecting livestock facilities. Write an "X" in the blank before each correct answer.

______a. Time of day

______b. Killing strength of disinfectant

______c. Temperature of air

______d. Dilution at which disinfectant is used

______e. Sterilization of facility before application of disinfectant

______f. Thoroughness of application and length of time before letting animals back in building (time of exposure)

______g. Temperature of disinfectant

10. Match methods of administering medicine to their correct descriptions. Write the correct numbers in the blanks.

______a. Introduced into rectum

______b. Introduced directly into uterus

______c. Applied to skin or mucous membranes of eye, ear, or nasal passage

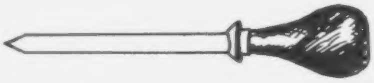
______d. Introduced into nose

______e. Placed directly into animal's body with needle and syringe

______f. Given by mouth by feeding, balling gun, drench applicator (gun), or dose syringe

1. Topical
2. Oral
3. Anal or rectal
4. Nasal
5. Injectable
6. Intrauterine

11. Label and discuss uses of the following equipment used to administer livestock medications and to monitor health care of livestock.

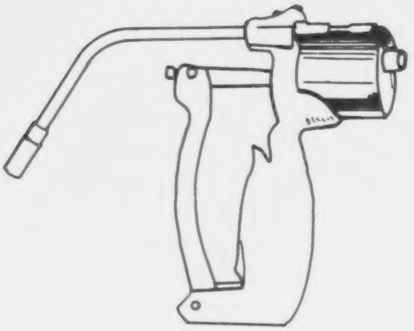


a. Name: ____

Use: ____

____

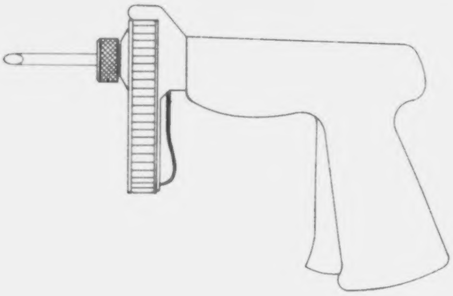
TEST



b. Name: ______________________________

Use: ______________________________

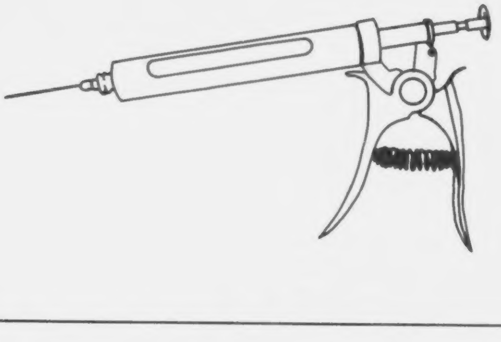
____



c. Name: ______________________________

Use: ______________________________

____

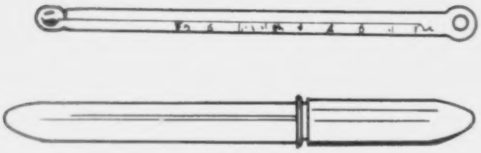


d. Name: ______________________________

Use: ______________________________

____

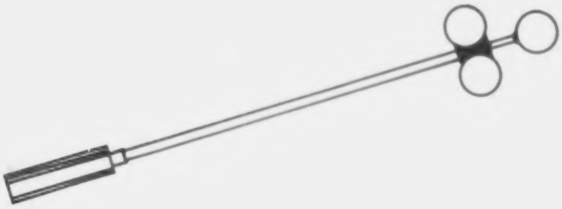
TEST



e. Name: ______________________________

Use: ______________________________

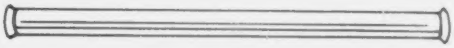
____



f. Name: ______________________________

Use: ______________________________

____

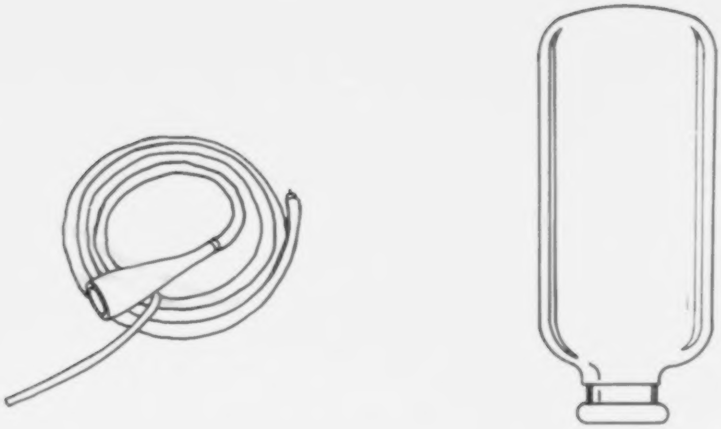


g. Name: ______________________________

Use: ______________________________

____

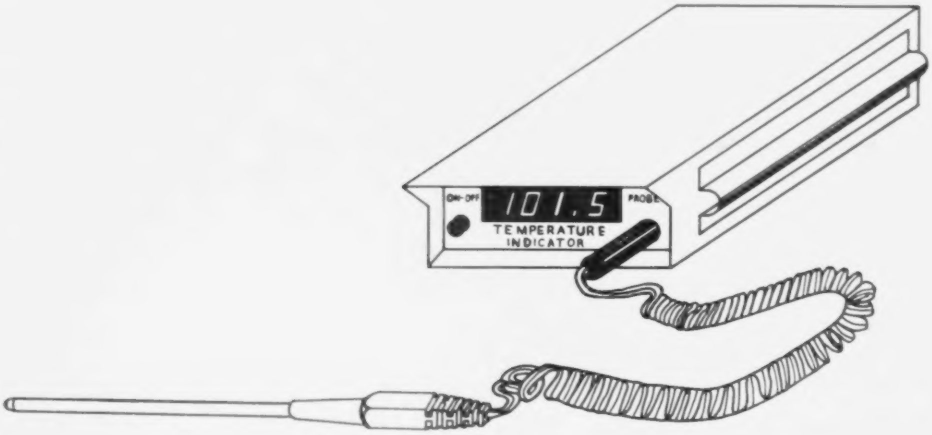
TEST



h. Name: ______________________________

Use: ______________________________

____

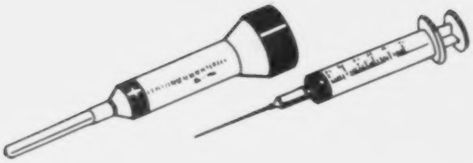

ON-OFF
101.5
PROBE
TEMPERATURE INDICATOR

i. Name: ______________________________

Use: ______________________________

____

TEST

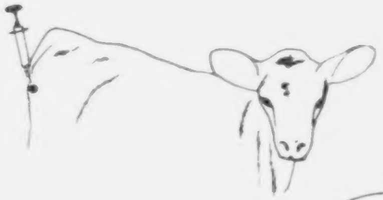


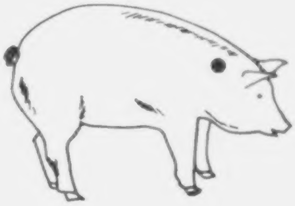
j. Name: ______________________________

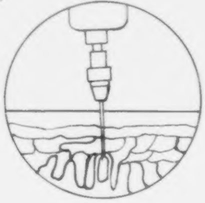
Use: ______________________________

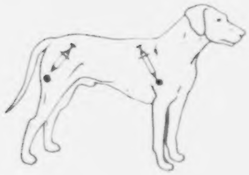
____

12. Label the following illustrations of injection sites with the correct injection method and description.









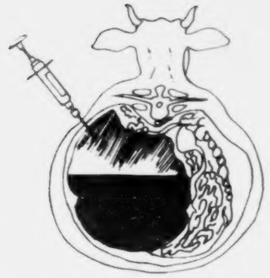
a. Injection method: ______________________________

Description: ______________________________

____

____

TEST

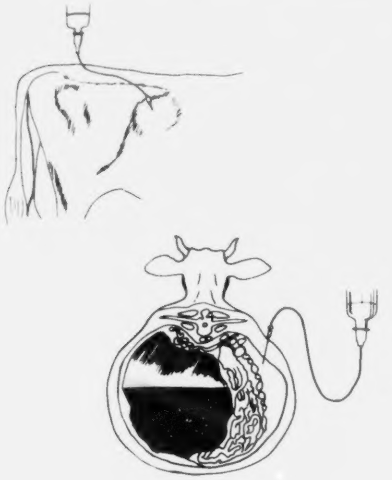


b. Injection method: ____________________

Description: ____________________

____

____



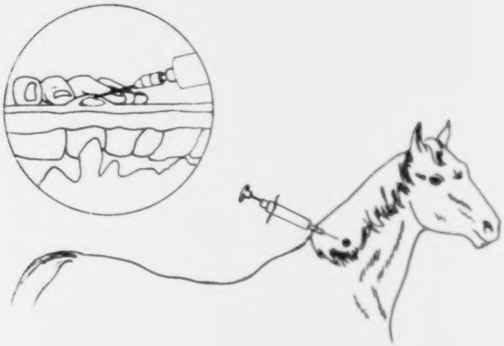
c. Injection method: ____________________

Description: ____________________

____

____

TEST

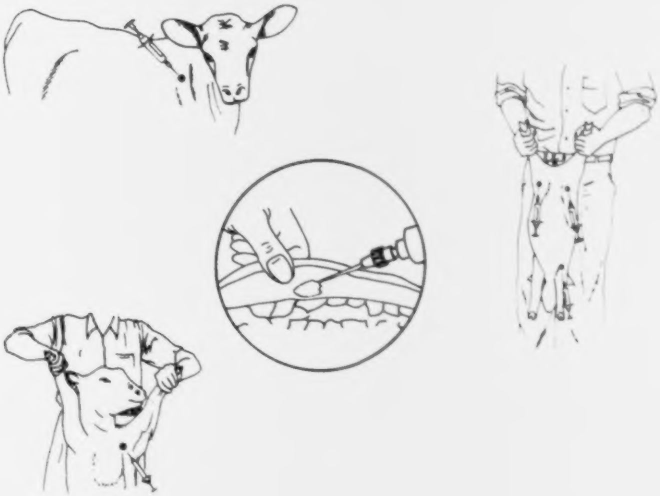


d. **Injection method:** ____________________

Description: ____________________

____

____



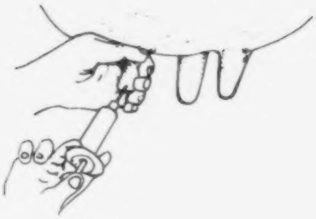
e. **Injection method:** ____________________

Description: ____________________

____

____

TEST

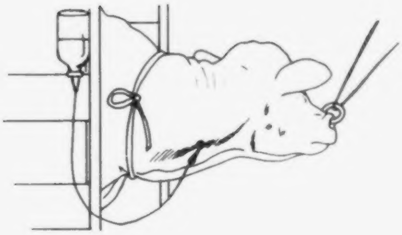


f. Injection method: ______________________________________

Description: ____

____

____



g. Injection method: ______________________________________

Description: ____

____

____

TEST

13. Select from the following list guidelines for proper vaccination of livestock. Write an "X" in the blank before each correct answer.

______a. Use a speculum tube that is clean and in good working order

______b. Use only the dose directed; do not overdose or underdose

______c. Inject by proper route, and use proper method

______d. Keep vaccine bottles refrigerated before, during, and after use

______e. Do not expose live biologicals to cold temperatures

______f. Do not vaccinate meat-producing animals within forty-one days of slaughter

______g. Never stab or inject in primal cuts; use shoulder or neck muscles

______h. Always get gestation history if possible

______i. Ensure that immunity will develop after vaccination by making sure that animal is healthy when vaccinated, administering vaccine correctly, and allowing proper time to observe negative reactions from vaccine

______j. Change needles for each animal when anaplasmosis may be a problem in the herd

(NOTE: Test items 14 and 15 list the assignment and job sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

14. Select methods, equipment, and locations for administering medication.

15. Demonstrate the ability to

    a. Fill a syringe.

    b. Take an animal's temperature.

    c. Give an intramuscular injection.

    d. Give an subcutaneous injection.

    e. Administer growth stimulant implants.

MAINTAIN ANIMAL HEALTH
UNIT II

ANSWERS TO TEST

1. a. 7
   b. 3
   c. 1
   d. 8
   e. 14
   f. 12
   g. 4
   h. 2
   i. 5
   j. 13
   k. 10
   l. 11
   m. 15
   n. 9
   o. 6

2. Answer should include any five of the following

   a. Contentment
   b. Alertness
   c. Aggressive appetite
   d. Sleek hair and smooth, pliable skin
   e. Bright eyes and pink eye membranes
   f. Normal feces and urine
   g. Normal temperature, pulse rate, and breathing rate
   h. Alert, normal ear set

3. Answer should include any ten of the following

   a. Lack of appetite or failure of young animals to nurse
   b. Listlessness
   c. Abnormal feces or urine
   d. Abnormal discharge from nose, mouth, or eyes
   e. Unusual posture
   f. Persistent rubbing or licking
   g. Dull hair and dry, scruffy skin
   h. Pale or red or purple mucous membranes lining eyes or gums
   i. Reluctance to move or unusual movements
   j. Higher than normal temperature
   k. Labored breathing—increased rate and depth
   l. Altered social behavior
   m. Sudden drop in production
   n. Ruminants not chewing their cuds

4. a. 4
   b. 1
   c. 3
   d. 5
   e. 2

ANSWERS TO TEST

5. Discussion should include the following

   a. Keep a complete set of records on each animal
   b. Develop a closed herd of females as soon as possible
   c. Obtain semen-tested virgin sires from known healthy herds
   d. Plan a preventive medicine schedule for all diseases and parasites for which protection is needed
   e. Institute and maintain a comprehensive sanitation program
   f. Conduct yearly physical examinations of brood stock

6. b, d, e, f, h, k

7. Answer should include any eight of the following

   a. Proper environmental conditions
   b. Affordable design, construction, and maintenance costs
   c. Convenience
   d. Durability
   e. Dryness
   f. Adequate lighting
   g. Safety
   h. Adequate space
   i. Rodent control
   j. Convenient location to adjacent structures
   k. Attractiveness

8. a. 12
   b. 3
   c. 6
   d. 10
   e. 15
   f. 13
   g. 2
   h. 7
   i. 9
   j. 14
   k. 4
   l. 8
   m. 11
   n. 1
   o. 5

9. b, d, f, g

10. a. 3
    b. 6
    c. 1
    d. 4
    e. 5
    f. 2

ANSWERS TO TEST

11. a. *Trocar and cannula* — Two-part device used to relieve bloat in cattle and sheep; when trocar is withdrawn, the cannula (a hollow tube) is left to allow gas to escape
    b. *Drench gun* — Used to administer orally liquid medication measured in cubic centimeters or ounces
    c. *Implant gun* — Used to deposit growth stimulant pellets in back of ear
    d. *Multidose syringe* — Used with needle to administer liquid injectables
    e. *Lineal animal thermometer* — Inserted into animal's rectum to check body temperature
    f. *Balling gun* — Used to administer pills, capsules, or boluses orally
    g. *Speculum tube* — Twenty-inch metal tube used with rubber tube to relieve cattle of bloat
    h. *IV equipment* — Used to administer medicine continually or intermittently over a period of time
    i. *Digital animal thermometer* — Inserted into animal's rectum to check body temperature
    j. *Single-dose disposable syringe* — Used with needle to administer liquid injectables

12. a. *Intramuscular injection (IM)* — Made deeply into large muscle with needle at least ¾ inch long
    b. *Intraruminal injection (IR)* — Made through left flank with 14-gauge, 3-inch needle
    c. *Intraperitoneal injection (IP) in cattle* — Made into right flank at point in center of triangle formed by loin, last rib, and line from top of last rib to hip bone
    d. *Intradermal injection (ID)* — Made into skin with 20- to 26-gauge needle
    e. *Subcutaneous injection (Sub Q)* — Made in any area where skin fits loosely, such as neck, chest wall, or flank; dosage is deposited under raised skin, and area is then massaged to facilitate distribution
    f. *Infusion intramammary (IMM)* — Made with cannula directly into teat canal after disinfecting teat and depressing teat to open sphincter muscle
    g. *Intravenous (IV) injection in cattle* — Made directly into jugular vein with 14- or 16-gauge, 1 ½- to 2-inch needle with point toward animal's heart

13. b, c, d, g, i, j

14. Evaluated to the satisfaction of the instructor

15. Performance skills evaluated to the satisfaction of the instructor

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

UNIT OBJECTIVE

After completing this unit, the student should be able to recognize the symptoms of common diseases and parasites seen in livestock and be able to determine methods to treat and control these diseases and parasites. The students should also be able to calculate mixes and dosage levels for animal health products. The student will show this ability by completing assignment sheets, job sheets, and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with animal parasites.
2. Label the life cycle stages of an internal parasite.
3. Match common internal parasites to their correct descriptions.
4. Label the life cycle stages of an external parasite.
5. Match common external parasites to their correct descriptions.
6. Match to their correct definitions terms associated with animal diseases.
7. Match common infectious diseases to their correct descriptions.
8. Match common noninfectious diseases to their correct descriptions.
9. List types of animal health products.
10. List label requirements for animal health products.
11. Discuss guidelines for using animal health products.
12. List factors to consider when calculating mixes or determining dosage levels for animal health products.
13. Determine prevention and controls for common parasites.
14. Determine treatment and controls for common diseases.
15. Interpret information on labels of animal health products.
16. Calculate mixes and dosage levels for animal health products.

OBJECTIVE SHEET

17. Demonstrate the ability to

    a. Use a drench gun.

    b. Administer worm paste.

    c. Administer a bolus.

    d. Install insecticide ear tag.

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

SUGGESTED ACTIVITIES

I. Unit contents
   - A. Objective sheet
   - B. Suggested activities
     1. Supplements
        - a. Supplement #1 — Grub Cycle Calendar
        - b. Supplement #2 — Warbex® Label
     2. Transparency masters
        - a. TM #1 — Life Cycle of an Internal Parasite
        - b. TM #2 — Life Cycle of an External Parasite
        - c. TM #3 — Life Cycle of the Cattle Grub (Heel Fly)
   - C. Information sheet
   - D. Assignment sheets
     1. Assignment Sheet #1 — Determine Prevention and Controls for Common Parasites
     2. Assignment Sheet #2 — Determine Treatment and Controls for Common Diseases
     3. Assignment Sheet #3 — Interpret Information on Labels of Animal Health Products
     4. Assignment Sheet #4 — Calculate Mixes and Dosage Levels for Animal Health Products
   - E. Answers to assignment sheets
   - F. Job sheets
     1. Job Sheet #1 — Use a Drench Gun
     2. Job Sheet #2 — Administer Worm Paste
     3. Job Sheet #3 — Administer a Bolus
     4. Job Sheet #4 — Install Insecticide Ear Tag
   - G. Test
   - H. Answers to test

SUGGESTED ACTIVITIES

II. Instructor's guide

A. Review unit and plan presentation.

B. Obtain materials to supplement unit.

1. Samples of various parasites

   (NOTE: Samples may be obtained from your local veterinarian.)

2. A variety of animal health products or their labels; product samples should include feed additives, boluses, powders, drenches, concentrated and pour-on liquids, injectibles, pastes, and aerosol sprays

3. Oklahoma State University Cooperative Extension fact sheets that pertain to livestock diseases and parasites

4. Animal health booklets published by manufacturers of various animal health products

   (NOTE: These booklets are usually available through your local animal health products supplier.)

5. Transparencies and competency profiles

   (NOTE: Transparencies and competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Provide students with unit, and discuss unit and specific objectives.

D. Introduce unit.

SUGGESTION:

- Enter into a discussion about the economics of a livestock enterprise. Begin by discussing the cost of feed, barn, equipment such as troughs and waterers, land, fuel, and trucking animals to market. Point out that these are all expenses we can *see* a capital outlay for. Then explain that there are *unseen* expenses, and discuss such things as lowered weight gains in animals as a result of parasites and the inability of animals to rebreed as a result of disease. Point out that these unseen expenses can also cause a direct loss in potential profit.

E. Discuss information, assignment, and job sheets.

1. Use Information Sheet, Section I to discuss terms and definitions associated with animal parasites.

   SUGGESTION:

   - Stress upon students the importance of being familiar with correct terminology in order to communicate effectively about animal parasites.

SUGGESTED ACTIVITIES

2. Use Information Sheet, Sections II and IV to discuss the life cycle stages of internal and external parasites.

   SUGGESTIONS:

   - Use Transparencies #1 through #3 and Supplement #1 to illustrate your discussion.
   - Point out that knowing the life cycles of the parasites will aid students in learning how to prevent the propagation of parasites.
   - Discuss the use of various parasiticides/insecticides and relate the application of each to the life cycle of the parasite it controls.

3. Use Information Sheet, Sections III and V to discuss common internal and external parasites and their descriptions.

   SUGGESTIONS:

   - Show the students samples of each of the various parasites discussed in these sections of the information sheet.
   - Provide students with fact sheets from Oklahoma State University Cooperative Extension, animal health booklets published by manufacturers of health products, and copies of good animal health books such as the *Stockman's Handbook*. Then assign each student to make a report on one of the common parasites discussed in these sections of the information sheet.
   - Discuss Assignment Sheet #1.
   - Have students complete Assignment Sheet #1.

4. Use Information Sheet, Section VI to discuss terms and definitions associated with animal diseases.

   SUGGESTION:

   - Stress upon students the importance of being familiar with correct terminology in order to communicate effectively about animal diseases.

5. Use Information Sheet, Sections VII and VIII to discuss common infectious and noninfectious diseases and their descriptions.

   SUGGESTIONS:

   - Point out to students that a large number of diseases exist and that they will need to consult their local veterinarian to discuss a thorough and effective prevention program for their particular livestock enterprises.

SUGGESTED ACTIVITIES

- Explain that the onset of most sicknesses are associated with one or more symptoms and that students should be familiar with the symptoms of the common diseases. Point out that prompt identification and treatment of diseases will help control economic losses.

- Relate that to some extent noninfectious diseases could also be called *nutritional diseases* because many noninfectious diseases are the result of nutritional deficiencies. Point out the practices that lead to nutritional disease: forced production, feeding forages and grains that are produced on leached and depleted soils, increased confinement of stock, etc.

- Discuss Assignment Sheet #2.

- Have students complete Assignment Sheet #2.

6. Use Information Sheet, Section IX to discuss types of animal health products.

   SUGGESTION:

   - Have available samples of the various types of animal health products mentioned in this section of the information sheet, discuss each type, and then show examples of the products commonly used in livestock operations. For example, point out that pharmaceuticals are products used to treat diseases or infections once illness occurs, and show the class examples of common pharmaceuticals: antibiotics, sulfonamides, corticosteriods, antihistamines, coagulants, etc.

7. Use Information Sheet, Section X to discuss label requirements for animal health products.

   SUGGESTIONS:

   - Use Supplement #2 to illustrate your discussion, while pointing out that the federal government requires that certain items be common to all animal health products labels, although additional information may be required on some product labels.

   - Explain that the label provides the user with some very important and useful information and that the students must learn to read and interpret this information.

   - Discuss Assignment Sheet #3.

   - Have students complete Assignment Sheet #3.

SUGGESTED ACTIVITIES

8. Use Information Sheet, Sections XI and XII to discuss guidelines for using animal health products and factors to consider when calculating mixes or determining dosage levels for animal health products.

   SUGGESTIONS:

   - Point out to students that all the guidelines mentioned in these sections of the information sheet are *general* rules they should follow when they use animal health products, but that reading the complete label instructions for product use, all precautionary information, and information for calculating mixes and dosage levels is of greatest importance.
   - Discuss Assignment Sheet #4.
   - Have students complete Assignment Sheet #4.
   - Discuss procedures in Job Sheets #1 through #4.
   - Have students complete Job Sheets #1 through #4.

F. Give test.

G. Critique test and discuss in class.

H. Reteach and retest as necessary.

I. Complete appropriate section of competency profiles.

III. Unit references

A. Blakely, James, and Dwight King. *The Brass Tacks of Animal Health*. St. Louis, Missouri: Doane Agricultural Service, Inc., 1978.

B. Braker, Clifton, R. "Pete." *Vocational Agriculture II*, rev. ed. Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1975.

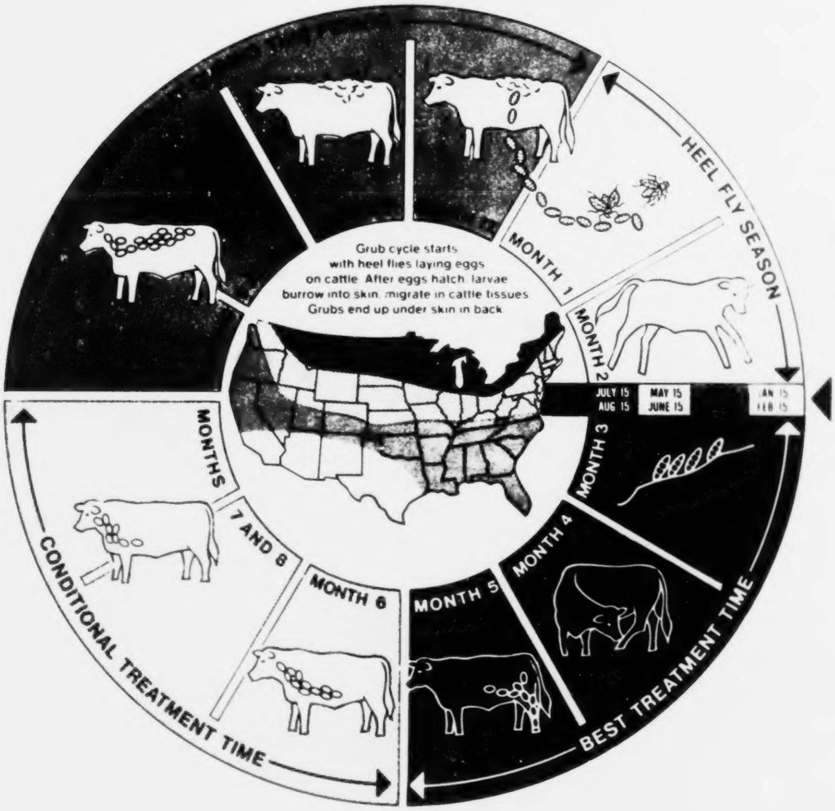
C. Ensminger, M.E. *The Stockman's Handbook*, 5th ed. Danville, Illinois: The Interstate Printers & Publishers, Inc., 1978.

SUGGESTED ACTIVITIES

SUPPLEMENT #1 — GRUB CYCLE CALENDAR

This chart can help you determine the best time to use WARBEX® to treat cattle for grubs. On the map, locate where your cattle originated. Dates on the corresponding color bar give approximate heel fly activity periods for each area. Find these months in the heel fly activity column below. By reading across, you can find the months for most effective treatment.

Heel fly activity	**Treat for best control**	**Treatment less effective**	**Treatment for grubs not recommended**
January 15-February 15	March-May	June-August	September-December
March 15-April 15	May-July	August-October	November-February
May 15-June 15	July-September	October-December	January-April
July 15-August 15	September-November	December-February	March-June


Grub cycle starts with heel flies laying eggs on cattle. After eggs hatch, larvae burrow into skin, migrate in cattle tissues. Grubs end up under skin in back
HEEL FLY SEASON
MONTH 1
MONTH 2
JULY 15 AUG 15
MAY 15 JUNE 15
JAN 15 FEB 15
MONTH 3
MONTH 4
MONTH 5
MONTH 6
MONTHS 7 AND 8
BEST TREATMENT TIME
CONDITIONAL TREATMENT TIME

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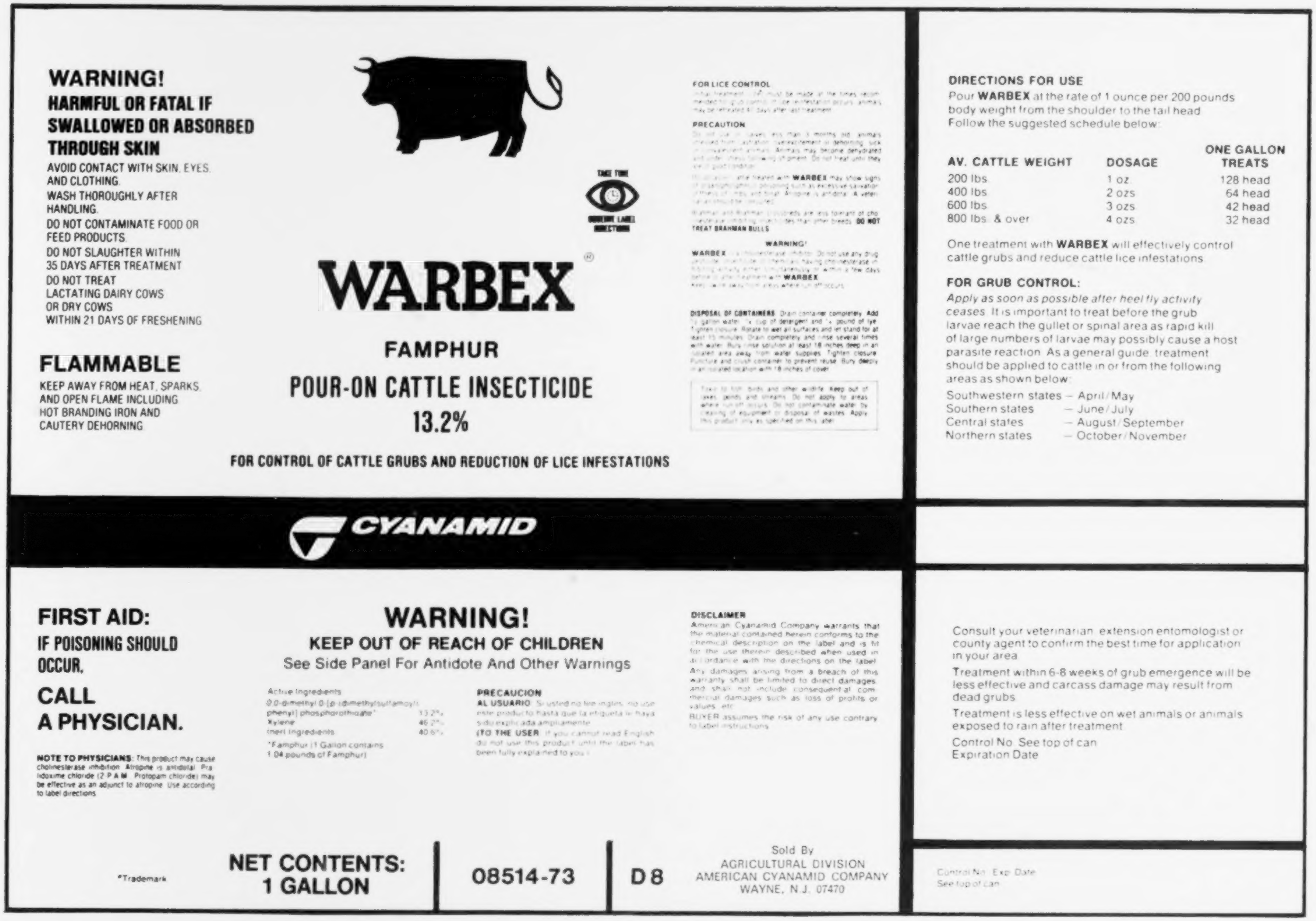
SUPPLEMENT #2 — WARBEX® LABEL



WARNING!

HARMFUL OR FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN

AVOID CONTACT WITH SKIN, EYES AND CLOTHING.
WASH THOROUGHLY AFTER HANDLING.
DO NOT CONTAMINATE FOOD OR FEED PRODUCTS.
DO NOT SLAUGHTER WITHIN 35 DAYS AFTER TREATMENT
DO NOT TREAT LACTATING DAIRY COWS OR DRY COWS WITHIN 21 DAYS OF FRESHENING

FLAMMABLE

KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME INCLUDING HOT BRANDING IRON AND CAUTERY DEHORNING.

TAKE TIME
OBSERVE LABEL DIRECTIONS

WARBEX®

FAMPHUR

POUR-ON CATTLE INSECTICIDE
13.2%

FOR CONTROL OF CATTLE GRUBS AND REDUCTION OF LICE INFESTATIONS

FOR LICE CONTROL

Initial treatment [illegible] must be made at the times recommended for grub control. If lice reinfestation occurs, animals may be retreated [illegible] days after last treatment.

PRECAUTION

Do not use on calves less than 3 months old, animals stressed from castration, overexcitement or dehorning, sick or convalescent animals. Animals may become dehydrated and under stress following shipment. Do not treat until they are in good condition.

Occasionally cattle treated with **WARBEX** may show signs of organophosphorus poisoning such as excessive salivation, stiffness of limbs and bloat. Atropine is antidotal. A veterinarian should be consulted.

Brahman and Brahman crossbreds are less tolerant of cholinesterase inhibiting insecticides than other breeds. **DO NOT TREAT BRAHMAN BULLS**

WARNING!

WARBEX is a cholinesterase inhibitor. Do not use any drug, pesticide, insecticide or chemicals having cholinesterase inhibiting activity either simultaneously or within a few days before or after treatment with **WARBEX**.
Keep cattle away from areas where run off occurs.

DISPOSAL OF CONTAINERS Drain container completely. Add ½ gallon water, ¼ cup of detergent and ¼ pound of lye. Tighten closure. Rotate to wet all surfaces and let stand for at least 15 minutes. Drain completely and rinse several times with water. Bury rinse solution at least 18 inches deep in an isolated area away from water supplies. Tighten closure. Puncture and crush container to prevent reuse. Bury deeply in an isolated location with 18 inches of cover.

Toxic to fish, birds and other wildlife. Keep out of lakes, ponds and streams. Do not apply to areas where run-off occurs. Do not contaminate water by cleaning of equipment or disposal of wastes. Apply this product only as specified on this label.

DIRECTIONS FOR USE

Pour **WARBEX** at the rate of 1 ounce per 200 pounds body weight from the shoulder to the tail head. Follow the suggested schedule below:

AV. CATTLE WEIGHT	DOSAGE	ONE GALLON TREATS
200 lbs.	1 oz.	128 head
400 lbs.	2 ozs.	64 head
600 lbs.	3 ozs.	42 head
800 lbs. & over	4 ozs.	32 head

One treatment with **WARBEX** will effectively control cattle grubs and reduce cattle lice infestations.

FOR GRUB CONTROL:

Apply as soon as possible after heel fly activity ceases. It is important to treat before the grub larvae reach the gullet or spinal area as rapid kill of large numbers of larvae may possibly cause a host parasite reaction. As a general guide, treatment should be applied to cattle in or from the following areas as shown below:

Southwestern states	– April/May
Southern states	– June/July
Central states	– August/September
Northern states	– October/November

CYANAMID

FIRST AID:

IF POISONING SHOULD OCCUR,

CALL A PHYSICIAN.

NOTE TO PHYSICIANS: This product may cause cholinesterase inhibition. Atropine is antidotal. Pralidoxime chloride (2-P.A.M., Protopam chloride) may be effective as an adjunct to atropine. Use according to label directions.

WARNING!

KEEP OUT OF REACH OF CHILDREN

See Side Panel For Antidote And Other Warnings

Active Ingredients	
0,0-dimethyl 0-[p-(dimethylsulfamoyl)-phenyl] phosphorothioate*	13.2%
Xylene	46.2%
Inert Ingredients	40.6%

*Famphur (1 Gallon contains 1.04 pounds of Famphur)

PRECAUCION

AL USUARIO: Si usted no lee ingles, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

(TO THE USER: If you cannot read English do not use this product until the label has been fully explained to you.)

DISCLAIMER

American Cyanamid Company warrants that the material contained herein conforms to the chemical description on the label and is fit for the use therein described when used in accordance with the directions on the label.

Any damages arising from a breach of this warranty shall be limited to direct damages and shall not include consequential commercial damages such as loss of profits or values, etc.

BUYER assumes the risk of any use contrary to label instructions.

Consult your veterinarian, extension entomologist or county agent to confirm the best time for application in your area.

Treatment within 6-8 weeks of grub emergence will be less effective and carcass damage may result from dead grubs.

Treatment is less effective on wet animals or animals exposed to rain after treatment.

Control No. See top of can
Expiration Date

®Trademark

NET CONTENTS:
1 GALLON

08514-73

D8

Sold By
AGRICULTURAL DIVISION
AMERICAN CYANAMID COMPANY
WAYNE, N.J. 07470

Control No. Exp. Date
See top of can

783

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782

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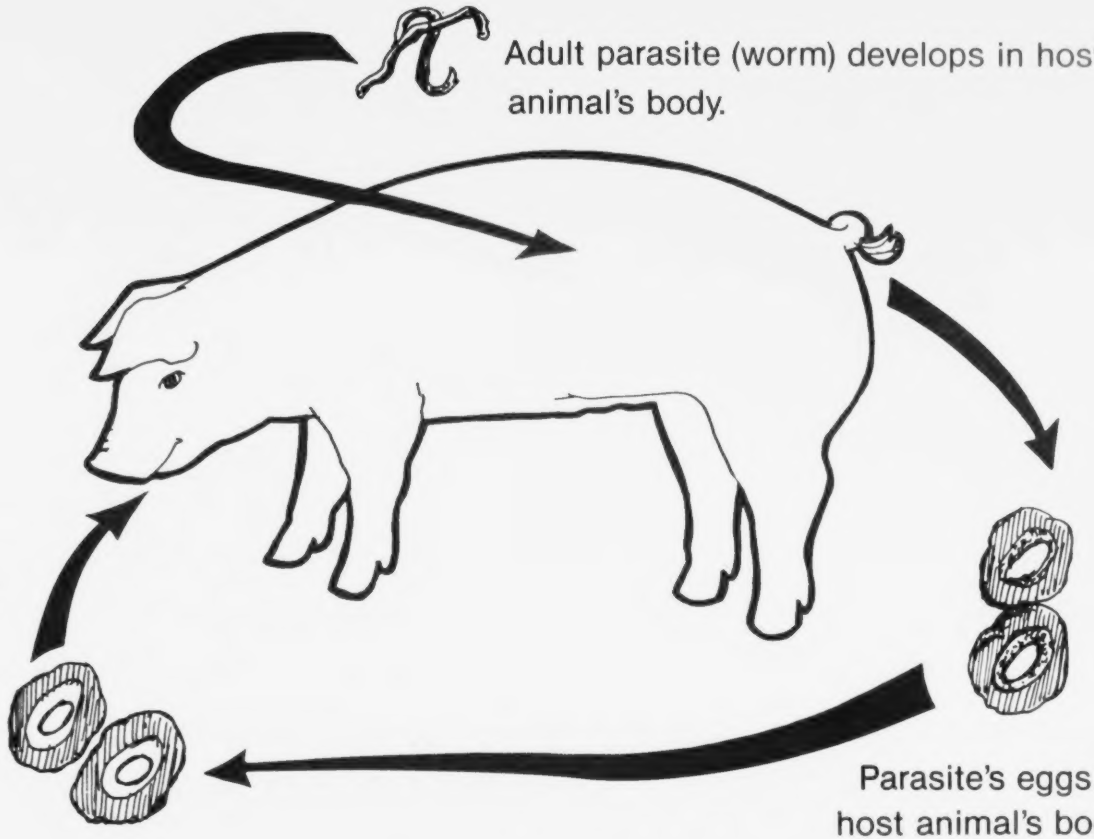
Life Cycle of an Internal Parasite

(Swine Intestinal Ascarid—Roundworm)



Adult parasite (worm) develops in host animal's body.

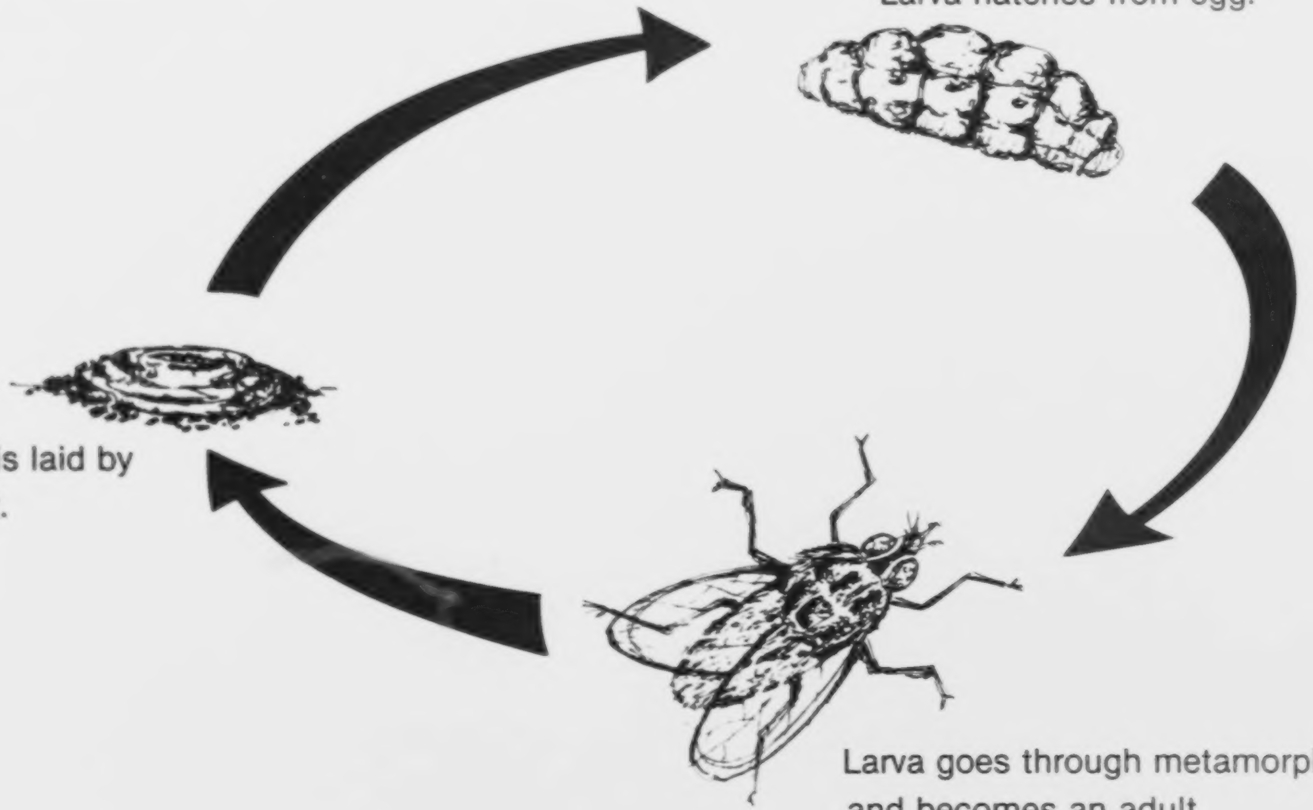
Parasite's eggs pass from host animal's body in feces.

Parasite's eggs are eaten by host animal.

TM #1

Life Cycle of an External Parasite

(The Horn Fly)

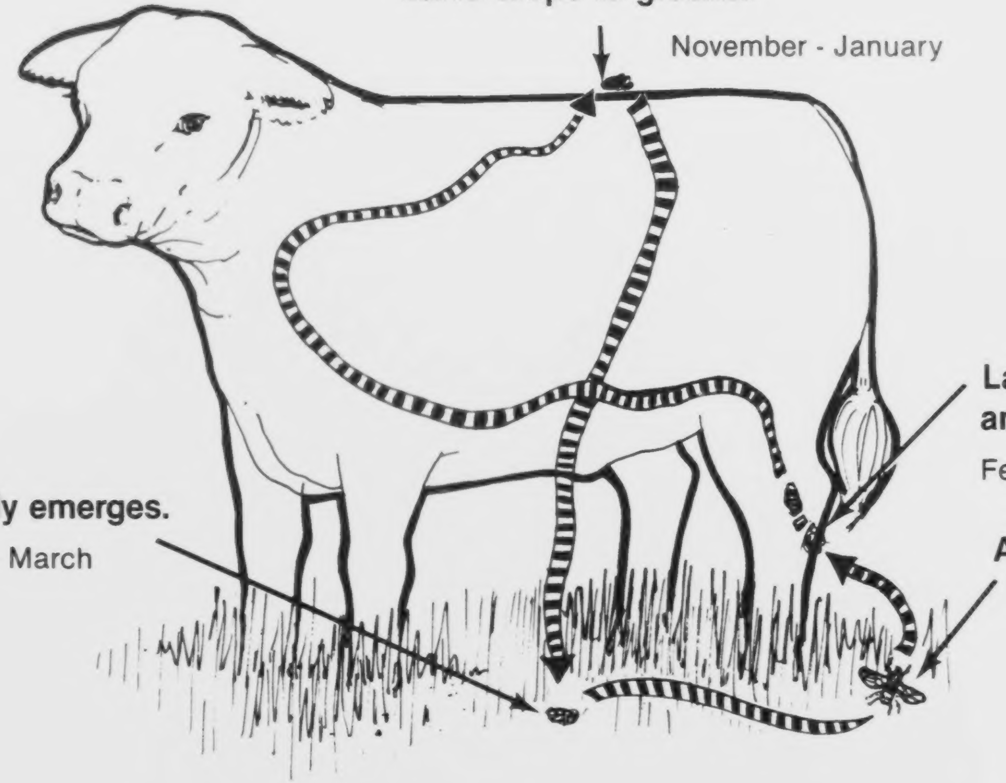


Larva hatches from egg.

Larva goes through metamorphosis and becomes an adult.

Egg is laid by adult.

Life Cycle of the Cattle Grub (Heel Fly)



Larva drops to ground.

November - January

Larva enters host animal's body.

February - April

Adult fly lays eggs.

February - March

Adult fly emerges.

February - March

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

INFORMATION SHEET

I. Terms and definitions associated with animal parasites

A. Parasite — Organism that lives in or on host animal and obtains food from host

B. Life cycle — Series of changes through which organism passes during its life

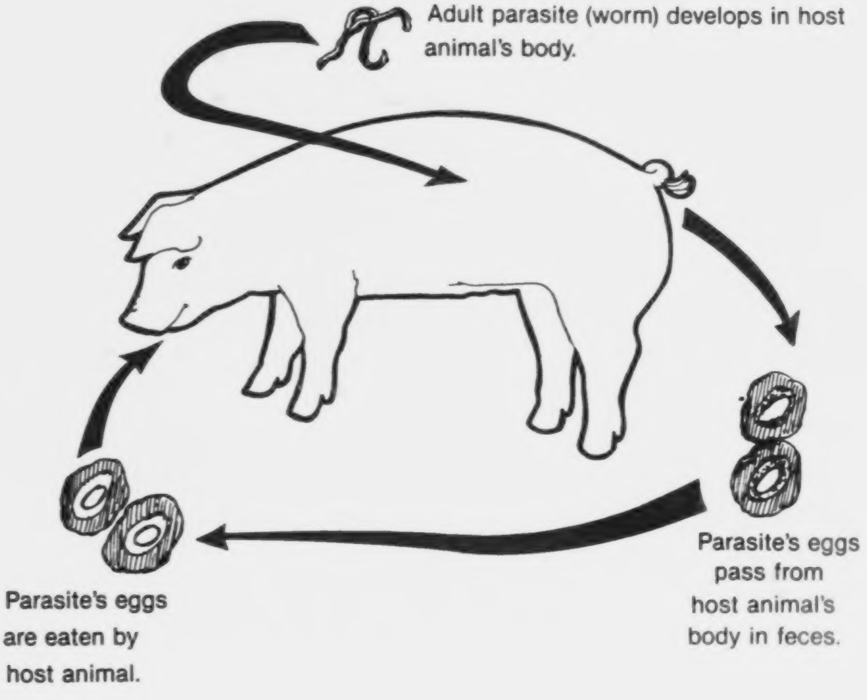
C. Metamorphosis — Change in form or structure of organism that occurs after birth or hatching

D. External parasite — Organism that lives on or under host animal's skin

E. Internal parasite — Organism that lives part of its life cycle inside host animal's body

II. Life cycle stages of internal parasites (Figure 1)

FIGURE 1


Adult parasite (worm) develops in host animal's body.
Parasite's eggs pass from host animal's body in feces.
Parasite's eggs are eaten by host animal.

INFORMATION SHEET

III. Common internal parasites and their descriptions

   A. Coccidia — Protozoan organisms that cause a disease known as coccidiosis, which produces diarrhea and bloody feces in cattle, sheep, goats, and poultry

   B. Gastrointestinal worms — Any of many species of worms found in the stomach, small intestine, and colon of cattle, sheep, goats, poultry, horses, and swine; cause loss of weight, anemia, and/or diarrhea

   C. Lungworms — White, threadlike, 1½- to 3-inch worms found in the trachea and bronchi of cattle, sheep, goats, and swine; cause coughing and labored breathing

   D. Ascarid — Large, yellowish or pinkish roundworms found in swine; migrating larvae produce liver damage and lung lesions resulting in verminous pneumonia

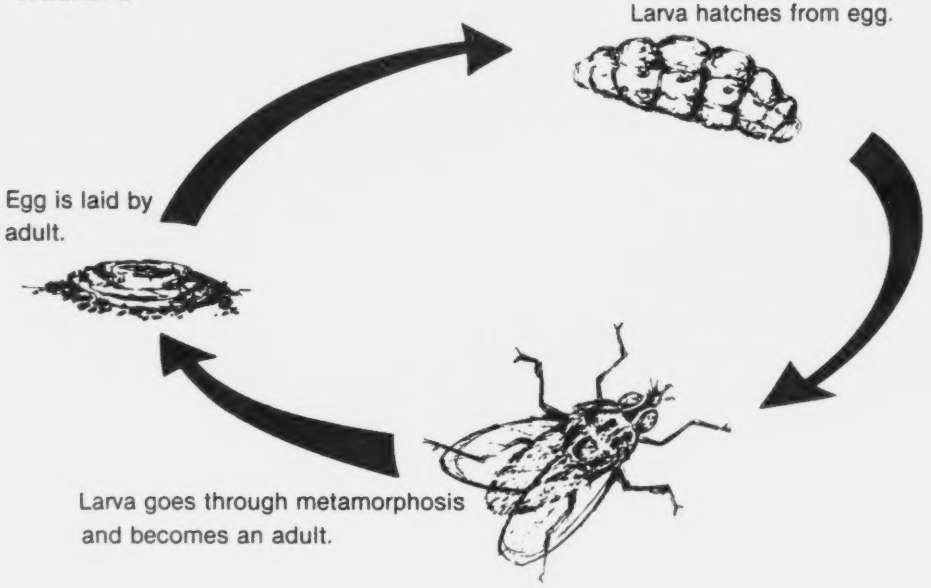
   E. Tapeworms — Long, ribbonlike worms that infest the intestines of sheep, goats, and horses; may cause death in sheep and goats by blocking cystic duct, gallbladder, and ducts of liver and pancreas

   F. Stomach worms — Worms that may infest the stomach of swine, cattle, sheep, and goats, but cause marked symptoms of unthriftiness and loss of appetite in goats and sheep

   G. Liver flukes — Flattened, leaflike brown worms that are usually 1 inch long; cause severe liver damage in cattle, sheep, and goats

IV. Life cycle stages of an external parasite (Figure 2)

FIGURE 2



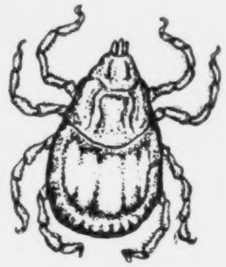
INFORMATION SHEET

V. Common external parasites and their descriptions (Figures 3-9)

A. Tick — Any of several species that feed exclusively on blood; found on cattle and horses, a heavy infestation will cause host animal to lose weight and become anemic and unthrifty

EXAMPLE:

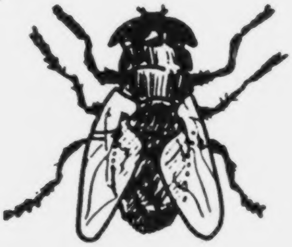
FIGURE 3



B. Blowfly — Any of a number of species of flies, all of which breed in the flesh of all farm animals, causing maggots to spread over host animal's body and feed on skin surface

EXAMPLE:

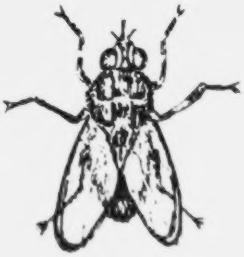
FIGURE 4



C. Horn fly — Small fly often found resting at base of horn on cattle; one of the most numerous and worst annoyances of cattle, causing tormented animal to refuse to graze during day and seek protection by hiding in dark buildings, brush, or tall grass

EXAMPLE:

FIGURE 5

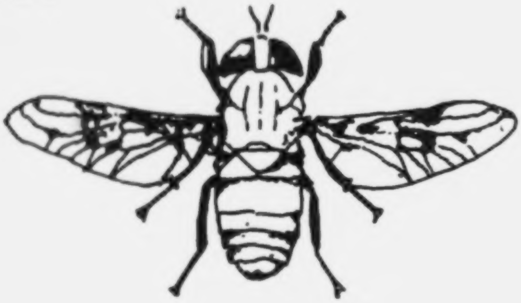


INFORMATION SHEET

D. Horsefly — Biting fly that attacks cattle and horses, inflicting a painful bite and causing heavily attacked animal to stop grazing

EXAMPLE:

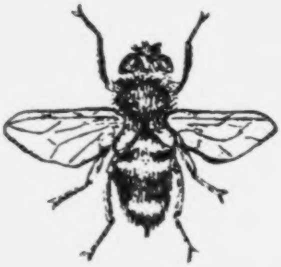
FIGURE 6



E. Grub (heel fly) — Fly that attacks the heels of cattle in early spring or summer, causing host animal to run madly with its tail over its back in an attempt to escape; larval stage causes conspicuous swelling in back of animal, usually from December to May

EXAMPLE:

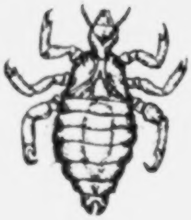
FIGURE 7



F. Louse — Small, flattened wingless parasite, most species of which are specific for a particular class of farm animal; causes intense irritation and restlessness and may cause severe itching

EXAMPLE:

FIGURE 8

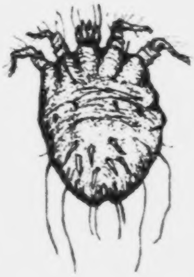


INFORMATION SHEET

G. Mite — Small parasite, most species of which are specific for a particular class of animal; causes mange, a marked irritation and crusting over of the skin accompanied by formation of thick, tough, wrinkled skin

EXAMPLE:

FIGURE 9



Copy for Section V adapted with permission of The Interstate Printers & Publishers, Inc., from *The Stockman's Handbook*, by M.E. Ensminger, 1978.

VI. Terms and definitions associated with animal diseases

A. Disease — Condition apart from normal that prevents performance of vital functions or normal activity

B. Pathogen — Disease-producing organism

C. Infection — Entry and development of a pathogen in or on animal's body

D. Contagious — Communicable by contact

E. Metabolic derangement — Unbalance of vital organs in animal's body

F. Infectious disease — Disease resulting from infection caused by a pathogen; may or may not be contagious

G. Noninfectious disease — Disease not due to infection by a pathogen but resulting from physical or chemical agents or metabolic derangement

H. Symptom — Any observable sign or evidence of disease

I. Abortion — Expulsion of dead or immature fetus

J. Bacteria — One-celled microorganisms that may be harmful and can be seen with a microscope

K. Virus — Ultramicroscopic or submicroscopic organism or agent that causes disease

INFORMATION SHEET

VII. Common infectious diseases and their descriptions

A. Brucellosis (Bang's disease) — One of the most serious and widespread bacterial diseases affecting cattle, goats, and swine, but rarely affecting sheep; abortion is the most characteristic symptom

B. Leptospirosis — Bacterial disease caused by several species of corkscrew-shaped organisms; disease affects cattle, sheep, goats, swine, and horses; symptoms are usually mild in most animals; but losses occur from poor growth in beef cattle, loss of production in dairy cows, and abortion in swine

C. Vibriosis — Bacterial disease caused by the bacterium *Vibrio fetus*, which affects sheep and cattle; symptoms include many abortions among ewes, especially during last four to six weeks of pregnancy, and abortion among cattle in middle third of pregnancy

D. Blackleg — Very infectious, highly fatal bacterial disease primarily affecting young cattle four months to two years old; symptoms include lameness and swelling, high fever, loss of appetite, and severe depression

E. Foot rot — Disease seen in cattle, sheep, and goats; lameness is usually the first symptom, followed by hoof infection and a characteristic foul odor

F. Scours — Disease caused by both viruses and bacteria; seen in young or newborn calves, symptoms include diarrhea, rough hair coat, and sunken eyes

G. Pinkeye — Bacterial or viral eye ailment seen in cattle, sheep, and goats; symptoms include swelling of lining membrane of eyelids

H. Erysipelas — Acute or chronic bacterial disease usually seen in swine; in acute form affected animals show a high fever, edema of the nose, ears, and limbs, and possibly purplish patches under the belly

I. Swine influenza — Suddenly appearing, viral infection of swine; symptoms include high fever, loss of appetite, cough, and discharge from nose and eyes; animal may sit up like a dog to facilitate breathing

J. Shipping fever — Viral or bacterial infection of cattle and sheep, especially lambs, brought on by environmental conditions creating stress; symptoms include high temperature, discharge from eyes and nose, hacking cough, difficulty in breathing, and possibly a swelling in the neck region

K. Pneumonia — Inflammation of lungs seen in all animals; symptoms include quick, shallow respiration, crackling noises with breathing, and standing with legs wide apart

L. Mastitis — Inflammation of udder seen in cattle, sheep, goats, and swine; in acute form, udder is hot, very hard, and tender; milk will be reduced greatly and may become lumpy or watery

INFORMATION SHEET

M. Warts — Viral infection usually seen on cattle but may affect other animals; symptoms include growths that may appear anywhere on the body and range in size from very small to very large

N. Red nose — Also known as *infectious bovine rhinotracheitis* or IBR; viral disease affecting cattle; symptoms generally include going off feed, weight loss, and coughing; animal may also slobber, show pain in swallowing, and produce a nasal discharge

O. Atrophic rhinitis — Bacterial infection usually affecting young pigs under 60 to 80 pounds; symptoms include persistent sneezing and snout that begins to wrinkle, bulge, and thicken when pig is from four to eight weeks old

P. Transmissible gastroenteritis (TGE) — Viral infection affecting young pigs; symptoms include marked scouring in all cases and vomiting in some cases

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VIII. Common noninfectious diseases and their descriptions

(NOTE: To some extent, noninfectious diseases could also be called *nutritional diseases*, because many noninfectious diseases are the result of nutritional deficiencies that manifest themselves as a problem in one of the body systems.)

A. Bloat — Nutritional disease affecting all ruminants; caused when animal is fed high-concentrate, low-roughage rations, producing trapped fermented gas

B. Milk fever — Nutritional disease affecting sheep and occasionally goats, but usually occurring after calving in high-producing cows; caused by low blood calcium concentration; symptoms include loss of appetite, constipation, and general depression followed by nervousness and finally collapse

C. Founder — Nutritional disease of horses, cattle, sheep, and goats; usually caused by overeating (grain, lush legumes, or grass) or overdrinking; first symptoms include extreme pain, fever, and reluctance to move; later symptoms include dropping of hoof soles and turning up of toe walls

D. Cancer eye — Malignancy originating in mucous membranes of cattle; commonly found in regions of intense sunlight

E. Prussic acid poisoning — Nutritional disease of cattle that have grazed on frost- or drought-damaged Johnson grass or Sudan grass; symptoms include staggered walking with animals going down quickly

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INFORMATION SHEET

IX. Types of animal health products

(NOTE: Many types of animal health products are on the market today, and many new products are constantly becoming available. Consult your veterinarian to plan an effective disease/parasite prevention program for your particular livestock operation.)

A. Pharmaceuticals

(NOTE: Pharmaceuticals are products used to treat disease or infection once illness occurs. Antibiotics, sulfonamides, corticosteroids, antihistamines, coagulants, anticoagulants, and anesthetics are all examples of pharmaceuticals.)

B. Biologicals

(NOTE: Biologicals are products used to prevent disease. The most common biological given animals is the vaccine, a preparation of killed or weakened microorganisms or viral agents introduced into the animal's system to produce immunity against a specific disease.)

C. Parasiticides/insecticides

(NOTE: In the context of this unit, only those products used to control livestock parasites through applications directly to animal or on animal's surroundings will be considered. Other types of insecticides are also available, such as those used to eliminate plant pests.)

D. Vitamins and minerals

(NOTE: In this unit, vitamins and minerals are to be considered from the clinical standpoint, where they are used to prevent or treat symptoms caused by disease or stress. For example, vitamins A, D, and E are sometimes given as a preventive measure to help cattle through the stress of a hard winter.)

E. Hormones

(NOTE: Therapeutic hormones are given to animals to correct malfunctions or to stimulate normal functions. For example, oxytocin is given to stimulate uterine contractions during a difficult birth to help an animal expel the fetus.)

X. Label requirements for animal health products

(NOTE: Label requirements for animal health products are established by one of three federal agencies: the Food and Drug Administration [FDA], the Environmental Protection Agency [EPA], or the United States Department of Agriculture [USDA]. On some products, additional information may be required, but these items are common to all animal health products.)

INFORMATION SHEET

- A. Name and address of manufacturer
- B. Statement of net contents
- C. Statement of active and inert ingredients present
- D. Full and complete directions for use
- E. Registration number
- F. Antidote statement when applicable
- G. Precautionary information adequate for safe use
- H. Tables or information for calculating mixes or determining dosage level

XI. Guidelines for using animal health products

- A. Buy only from reputable manufacturer and distributor
- B. Reject any product that may have lost its effectiveness
- C. Carefully read complete instructions for product use and follow them faithfully
- D. Carefully read precautionary information and follow it faithfully
- E. Carefully read all information for calculating mixes and determining dosage levels and follow it faithfully

XII. Factors to consider when calculating mixes or determining dosage levels for animal health products

(NOTE: Always follow the product's label recommendations for calculating mixes and determining dosage level; otherwise, harm—or even death—may come to the animal being treated or to humans involved in administering the product.)

- A. Method of applying product

  EXAMPLES: Drench, spray, injection

- B. Unit of measure to be used for size of animal being treated

  EXAMPLES: Cubic centimeters per hundred pounds of body weight; fluid ounces of drench mixture per hundred pounds of body weight

- C. Species of animal being treated

  (NOTE: Some products are to be used only for beef cattle, or only for swine, or only for sheep.)

INFORMATION SHEET

D. Age, sex, and state of animal being treated

(NOTE: When determining the state of the animal, consider both the animal's state of production and the animal's present physical state. For example, some medicines cannot be given to lactating dairy cows and some strong medicines cannot be given in conjunction with dehorning or castration.)

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

ASSIGNMENT SHEET #1 — DETERMINE PREVENTION AND CONTROLS FOR COMMON PARASITES

NAME ______________________________ SCORE ______________

Animals are attacked by a wide variety of internal and external parasites, which reduce production and therefore cost farmers and ranchers millions of dollars yearly. There are two requirements for controlling and treating animal parasites to reduce this loss: (1) you must be able to recognize the symptoms of infestation caused by a particular parasite and (2) you must be familiar with the various preventions and controls used to stop the spread of each parasite. The purpose of this assignment sheet is to make you more familiar with those requirements in regard to the common internal and external parasites that affect livestock.

Study the tables on internal and external parasites found at the end of this assignment sheet, and then answer the following questions.

A. 1. What external parasite causes irritation, restlessness, and loss of condition in heavily attacked animal, and anaplasmosis in cattle?

____

2. What methods are used to prevent and control this parasite?

____

____

B. 1. What external parasite infects wounds, causes hair or fleece to become soiled, and causes weakness and fever?

____

2. What methods are used to prevent and control this parasite?

____

____

C. 1. What internal parasite causes coughing, labored breathing, loss of appetite in cattle, sheep, goats, and swine, and causes young animals to become stunted and unthrifty?

____

2. What methods are used to prevent and control this parasite?

____

____

ASSIGNMENT SHEET #1

D. 1. What internal parasite causes diarrhea, bloody feces, and weakness in cattle, sheep, goats, and poultry?

____

2. What methods are used to prevent and control this parasite?

____

____

E. 1. What internal parasite causes loss of weight, poor rate of gain, anemia, and/or diarrhea in cattle, sheep, goats, poultry, horses, and swine?

____

2. What methods are used to prevent and control this parasite?

____

____

F. 1. What internal parasite causes swine to cough and breathe hard, and young pigs to become unthrifty and stunted?

____

2. What methods are used to prevent and control this parasite?

____

____

G. 1. What internal parasite causes anemia, digestive disturbances, loss of weight, and liver damage in cattle, sheep, and goats?

____

2. What methods are used to prevent and control this parasite?

____

____

ASSIGNMENT SHEET #1

H. 1. What external parasite causes loss of weight, anemia, and unthriftiness in cattle and horses, and may also cause anaplasmosis?

____

2. What methods are used to prevent and control this parasite?

____

____

I. 1. What external parasite causes intense irritation, restlessness, and severe itching in all farm animals, and may cause anemia?

____

2. What methods are used to prevent and control this parasite?

____

____

J. 1. What external parasite causes marked irritation and crusting over of skin accompanied by formation of thick, tough, wrinkled skin?

____

2. What methods are used to prevent and control this parasite?

____

____

K. 1. What external parasite attacks the heels of cattle in early spring or summer, causing the animal to run madly with its tail over its back?

____

2. What methods are used to prevent and control this parasite?

____

____

ASSIGNMENT SHEET #1

Table 1: Common internal parasites, symptoms, preventions and controls

Parasite	Species affected	Symptoms	Preventions and controls
Coccidia	Cattle Sheep Goats Poultry	Diarrhea, bloody feces, weakness	Avoid contaminated feed and water; keep feeders and waterers sanitary; isolate affected animals; consult veterinarian; use coccidiastats
Gastrointestinal worms	Cattle Sheep Goats Poultry Horses Swine	Loss of weight, poor rate of gain, anemia, diarrhea	Rotate pastures; isolate calves and lambs from adult animals; keep feeders and waterers sanitary; use parasiticides
Lungworms	Cattle, especially calves Sheep Goats Swine	Coughing, labored breathing, loss of appetite; young animals become stunted and unthrifty	Practice good sanitation; do not spread infested manure on pasture; use parasiticide
Ascarid	Swine	Coughing and hard breathing; young pigs become unthrifty and stunted; liver damage	Clean farrowing quarters; wash sows before farrowing; place sows on clean pasture after farrowing; use parasiticide
Tapeworms	Sheep Goats Horses	May cause death in sheep and goats by blocking cystic duct, gallbladder, and ducts of liver and pancreas, no specific symptoms in horses	Practice pasture rotation; use parasiticide
Stomach worms	Swine Sheep Goats Cattle	Marked symptoms of unthriftiness and loss of appetite in goats and sheep; no specific symptoms in other animals	Practice pasture rotation; drench with parasiticide
Liver flukes	Cattle Sheep Goats	Anemia, digestive disturbances, loss of weight, liver damage	Avoid wet pastures; use drench of flukacide

ASSIGNMENT SHEET #1

Table 2: Common external parasites, symptoms, preventions and controls

Parasite	Species affected	Symptoms	Preventions and controls
Tick	Cattle Horses	Loss of weight; animal may become anemic and unthrifty; may cause anaplasmosis	Spray or dust frequently; use Malathion or other current market parasiticide
Blowfly	All farm animals	Infected wounds; soiled hair or fleece; weakness; fever	Use proper procedure for destroying dead animals; use traps, poisoned baits, and repellents
Horn fly	Cattle	Tormented animal refuses to graze during day; animal seeks protection by hiding in buildings, brush, or tall grass	Remove manure from around barn; spray animals frequently from early May until frost; use Methoychlor, Malathion, Ronnel, Co-Ral, or other appropriate parasiticide
Horsefly	Cattle Horses	Irritation, restlessness, loss of condition as heavily attacked animal will stop grazing; causes anaplasmosis in cattle	Keep animals from heavy brush areas; no totally effective spray is available, but frequent spraying for flies helps from May until frost; use Pyrethrins
Grub (heel fly)	Cattle	Grub (larva) causes swelling in backs of animals from December to May; adult attacks heels of cattle in early spring or summer, causing animal to run madly with its tail over its back	Control flies between June and October; use systemic grub-control insecticide, but not after October 15
Louse	All farm animals	Intense irritation, restlessness, severe itching; may cause animal to become anemic	Spray frequently from October until spring; use Co-Ral, Malathion, or other appropriate parasiticide
Mite	All farm animals	Marked irritation and crusting over of skin accompanied by formation of thick, tough, wrinkled skin	Spray or dip animal with line sulfur

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

ASSIGNMENT SHEET #2 — DETERMINE TREATMENT AND CONTROLS FOR COMMON DISEASES

NAME ______________________________ SCORE ______________

Preventing animal diseases is an important part of increasing production, limiting losses, and therefore improving your profit picture. You, the producer, have already lost money if disease occurs in your animals, but perhaps your losses can be limited if you are able to recognize the symptoms of common diseases and know the best methods of treating and controlling these diseases. The purpose of this assignment sheet is to make you more familiar with disease symptoms, treatment, and control.

Study the tables at the end of this assignment sheet, and then answer the following questions.

A. 1. What noninfectious disease occurs primarily in high-producing cows after calving and causes loss of appetite, constipation, and general depression followed by nervousness and finally collapse?

____

2. What methods are used to treat and control this disease?

____

____

B. 1. What noninfectious disease occurs in cattle in which the skin around the eye is unpigmented and causes a small tumor on the mucous membrane and irritation around the eye?

____

2. What methods are used to treat and control this disease?

____

____

C. 1. What acute infectious disease of swine causes high fever, edema of nose, ears, and limbs, and, possibly, purplish patches under the belly?

____

2. What methods are used to treat and control this disease?

____

____

ASSIGNMENT SHEET #2

D. 1. What infectious disease causes high fever, loss of appetite, cough, and discharge from the eyes and nose of swine, and may also cause the animal to sit up like a dog to facilitate breathing?

____

2. What methods are used to treat and control this disease?

____

____

E. 1. What infectious disease affects cattle and sheep, especially lambs, causing infected animal to have a high temperature, discharge from eyes and nose, hacking cough, and difficulty in breathing—symptoms that usually occur after animal has been placed under some form of stress created by environmental conditions?

____

2. What methods are used to treat and control this disease?

____

____

F. 1. What infectious disease affects cattle—mostly Herefords—sheep, and goats and causes eyes to water and swelling of lining membrane of eyelid followed by blindness if condition is allowed to continue without treatment?

____

2. What methods are used to treat and control this disease?

____

____

G. 1. What infectious disease occurs in all animals and causes high fever, quick, shallow respiration, crackling noises with breathing, and standing with legs wide apart?

____

2. What methods are used to treat and control this disease?

____

____

ASSIGNMENT SHEET #2

H. 1. What infectious disease affects cattle, sheep, goats, and swine, causing the udder to be hot, very hard, and tender, an increase in temperature, and milk flow to be reduced and become watery or lumpy?

____

2. What methods are used to treat and control this disease?

____

____

I. 1. What infectious disease causes growths on the skin that vary in size from very small to very large, usually appearing on the teats or around the head of cattle?

____

2. What methods are used to treat and control this disease?

____

____

J. 1. What noninfectious disease affects all ruminants, causing an enlarged paunch on the left side in front of the hipbone, followed by distention of the right side and difficult breathing?

____

2. What methods are used to treat and control this disease?

____

____

K. 1. What noninfectious disease causes staggered walking in cattle with animal going down quickly?

____

2. What methods are used to treat and control this disease?

____

____

L. 1. What noninfectious disease affects cattle, horses, sheep, and goats, causing extreme pain, fever, and reluctance to move, followed by dropping of hoof soles and turning up of toe walls?

____

2. What methods are used to treat and control this disease?

____

____

ASSIGNMENT SHEET #2

M. 1. What infectious disease affects cattle, causing animal to go off feed, lose weight, cough, and possibly show pain in swallowing?

____

2. What methods are used to treat and control this disease?

____

____

N. 1. What infectious disease of swine causes animal to have marked scouring and possible vomiting while body temperature remains normal?

____

2. What methods are used to treat and control this disease?

____

____

O. 1. What infectious disease causes young pigs under 60 to 80 pounds to sneeze persistently and form a snout that begins to wrinkle, bulge, and thicken when pig is from four to eight weeks old?

____

2. What methods are used to treat and control this disease?

____

____

P. 1. What infectious disease of cattle, goats, swine, and sometimes sheep causes abortion and retained placenta?

____

2. What methods are used to treat and control this disease?

____

____

ASSIGNMENT SHEET #2

Table 3: Common infectious diseases, symptoms, treatments and controls

Disease	Species affected	Symptoms	Treatment and control
Atrophic rhinitis	Young pigs under 60 to 80 pounds	Persistent sneezing and snout that begins to wrinkle, bulge, and thicken when pig is from four to eight weeks old	Select breeding stock from herds known to be clean; use clean farrowing quarters; treat with sulfonamide drugs
Blackleg	Young cattle, primarily four months to two years Sheep, all ages	Cattle: sudden sickness or death; high fever; lameness; stiffness; swelling of muscles; crackling sound heard when areas are touched Sheep: swellings in region of recent wound from shearing, castrating, docking, bruising from fighting, etc.	Burn or bury carcasses; vaccinate sheep two to four weeks before shearing, castrating, and docking; vaccinate all calves at three to four months of age
Brucellosis (Bang's disease)	Cattle Goats Swine Sheep, rarely	Abortion; retained placenta	No treatment known; slaughter infected animal; vaccinate calves; clean areas of infection thoroughly
Erysipelas	Swine	Acute form: high fever; edema of nose, ears, and limbs; possible purplish patches under belly	Isolate sick animal; clean and disinfect pen; give antibiotics; vaccinate once or twice a year
Foot rot	Cattle Sheep Goats	Lameness, followed by hoof infection; characteristic foul odor	Eliminate source of foot injuries; move affected animal to dry quarters; trim inflammed foot and wash with warm, soapy water; disinfect; give sulfa drugs and antibiotics; vaccinate to reduce incidence
Leptospirosis	Cattle Swine Sheep Goats Horses	Mild symptoms in most animals; poor growth in beef cattle; loss of production in dairy cows; abortion in swine	Perform blood test; vaccinate all animals; isolate new or sick animals; refer to vet for possible blood transfusions and appropriate antibiotics for infected animals

ASSIGNMENT SHEET #2

Table 3: (continued)

Disease	Species affected	Symptoms	Treatment and control
Mastitis	Cattle Sheep Goats Swine	Acute form: udder is hot, very hard and tender; increase in temperature; milk flow is reduced and may become watery or lumpy Chronic form: only symptom is thick or lumpy milk Sheep: chronic discharge from teats or gangrene (blue bag)	Eliminate source of udder injury; provide clean bedding; treat with antibiotics
Pinkeye	Cattle, mostly Herefords Sheep Goats	Watering and squinting of eye; swelling of lining membrane of eyelid; blindness if condition is not treated	Isolate affected animal; treat with antibiotics; provide good nutrition, including vitamin A
Pneumonia	All animals	High fever; quick, shallow respiration; cracking noises with breathing; standing with legs wide apart	Isolate infected animals and treat with sulfa drugs and antibiotics; practice good, sound husbandry and provide good hygenic surroundings
Red nose (infectious bovine rhinotracheitis)	Cattle	Animal goes off feed; weight loss; coughing; may show pain in swallowing; slobbering; nasal discharge	Practice good sanitation; isolate infected animal; vaccinate; no specific treatment, but give sulfonamides and antibiotics to combat secondary infections
Scours	Cattle, especially young or newborn calves under two days old	Diarrhea, rough hair coat, sunken eyes	Treat severely affected calf by discontinuing milk for twenty-four to fourty-eight hours; give fluids to combat dehydration; give antibiotics; isolate newborn animals
Shipping fever	Cattle Sheep, especially lambs	Environmental conditions creating stress cause high temperature, discharge from eyes and nose, hacking cough, difficulty in breathing; possibly a swelling in neck region	Provide good feeding and management; vaccinate three weeks before stressing cattle; isolate infected animals; treat with antibiotics

ASSIGNMENT SHEET #2

Table 3: (continued)

Disease	Species affected	Symptoms	Treatment and control
Swine influenza	Swine	High fever, loss of appetite, cough, discharge from nose and eyes; animal may sit up like a dog to facilitate breathing	Provide warm, clean, well-ventilated quarters and ample supply of fresh water; use antibiotics
Transmissible gastroenteritis (TGE)	Swine	Marked scouring in all cases and vomiting in some cases; normal body temperature; inflammed stomach and intestines	Move and scatter sows that have not farrowed; avoid continuous farrowing; isolate new additions to herd; practice good feeding and management; no effective treatment, but give antibiotics or sulfonamides to prevent secondary infection
Warts	Cattle, primarily but may affect other animals	Growths on skin varying from very small to large cauliflower-like growths weighing several pounds; may appear anywhere on body but are usually found on the teats or around the head	Isolate infected cattle; clean and disinfect pens; vaccinate or remove warts surgically
Vibriosis	Cattle Sheep	Many abortions among ewes, especially during last four to six weeks of pregnancy; abortion in middle third of pregnancy for cattle	Vaccinate two months before breeding animal; use antibiotics; allow sexual rest; practice good sanitation

ASSIGNMENT SHEET #2

Table 4: Common noninfectious diseases, symptoms, treatments and controls

Disease	Species affected	Symptoms	Treatment and control
Bloat	All ruminants	Enlarged paunch on left side in front of hipbone, followed by distention of right side; difficult breathing	Feed dry hay before putting animal on green, lush pasture; change feed; treat affected animal by giving defoaming agents such as peanut oil, corn oil, or soybean oil by stomach tube; keep animal on feet and moving
Cancer eye	Cattle, primarily in breeds in which skin around eye is unpigmented	Small tumor on mucous membrane; irritation around eye	Early diagnosis followed by surgery or treatment with an electronic device
Founder	Cattle Horses Sheep Goats	Extreme pain, fever, and reluctance to move; later followed by dropping of hoof soles and turning up of toe walls	Avoid overfeeding and overdrinking; destroy severe cases; stand animal's feet in cold-water bath until vet arrives
Milk fever	Cattle, primarily high-producing cows after calving Sheep Goats, occasionally	Loss of appetite, constipation, and general depression followed by nervousness and finally collapse	Keep good supply of vitamins and minerals available; feed a high-phosphorous low-calcium diet during last ten to fourteen days of pregnancy; treat with injections of calcium glucose given intravenously
Prussic acid poisoning	Cattle	Staggered walking, with animal going down quickly	Keep cattle from grazing on frost- or drought-damaged Johnson grass or Sudan grass; treat promptly with nitrate boluses

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

ASSIGNMENT SHEET #3 — INTERPRET INFORMATION ON LABELS OF ANIMAL HEALTH PRODUCTS

NAME ______________________ SCORE __________

Federal agencies require that manufacturers of animal health products develop a label and have the label approved prior to marketing the product. The information written on the label has been said to be some of the most expensive words in all literature. This statement may well be true since the research, development, and registration procedures behind a label frequently cost the manufacturer three to five years' time and millions of dollars. The label also provides you, the user, with some very important and useful information that you must learn to read and interpret. This assignment sheet will give you practice in reading and interpreting the information found on the labels of animal health products.

PART I

Study the WARBEX® label found at the end of this assignment sheet, and then answer the following questions.

A. What kind of insecticide is WARBEX®? ______________________

B. What percentage is the solution? ______________________

C. Can WARBEX® be used with lactating dairy cattle? ______________________

D. Can WARBEX® be used on cattle heading for immediate slaughter? ______________________

____

E. What company manufacturers and sells WARBEX®? ______________________

____

F. When is the best time to apply WARBEX® in Southern States? ______________________

G. How many treatments should you make? ______________________

H. How many ounces of WARBEX® should you use with 400-pound animals? __________

I. What antidote should be used for WARBEX®? ______________________

PART II

Study the DECKEM™ insecticide ear tag label found at the end of this assignment sheet, and then answer the following questions.

A. What is the percentage of active ingredients in the tag? ______________________

B. What is the net weight per tag? ______________________

C. What type of storage is recommended for the tags? ______________________

____

ASSIGNMENT SHEET #3

D. What type of parasites does the tag control? ______________________________

____

E. What is the percentage of inert ingredients? ______________________________

F. Can the tags be used on lactating dairy cows? ______________________________

G. What company manufactures the tags? ______________________________

____

H. How should the container be disposed of? ______________________________

____

I. What type of safety precautions should you take after installing the tag?______________

____

PART III

Study the TRAMISOL® soluble drench powder label at the end of this assignment sheet, and then answer the following questions.

A. What species of livestock is this product to be used on? ______________________________

B. What parasites is this product used for? ______________________________

____

C. How much water is the packet of powder to be mixed with? ______________________________

D. How much of the mixed solution should be given to a 200-pound sheep?______________

____

E. How many 100-pound sheep will one packet of this product treat? ______________

F. How long after giving this medication must you wait before slaughtering an animal for human consumption? ______________________________

G. How long can excess amounts of the solution be stored and still be usable? ______________

____

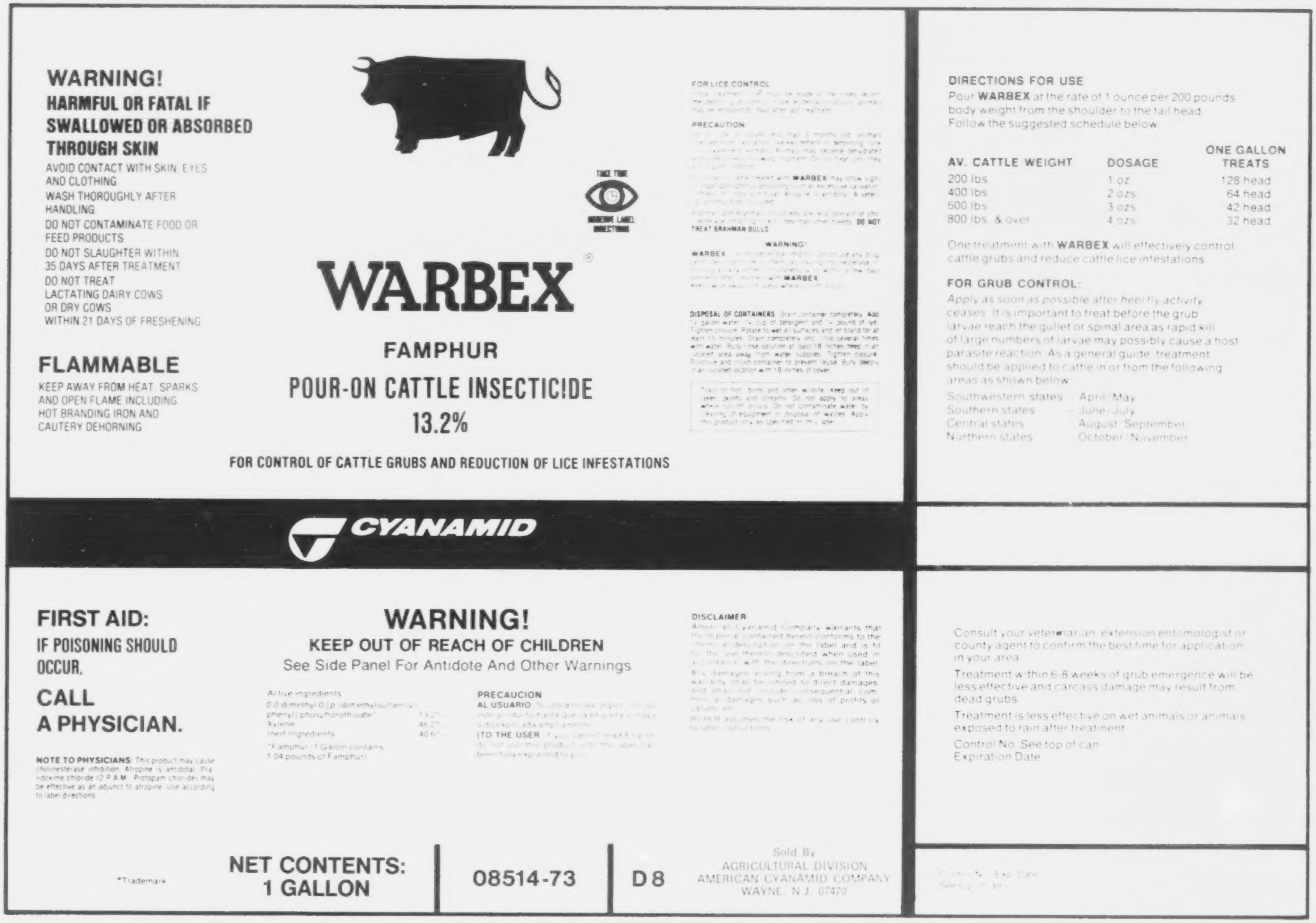
H. What is the last sentence of the warning for this product? ______________________________

____

I. What must be done to the product after the water is added to the powder? ______________

____

ASSIGNMENT SHEET #3



WARNING!
HARMFUL OR FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN

AVOID CONTACT WITH SKIN, EYES AND CLOTHING
WASH THOROUGHLY AFTER HANDLING
DO NOT CONTAMINATE FOOD OR FEED PRODUCTS
DO NOT SLAUGHTER WITHIN 35 DAYS AFTER TREATMENT
DO NOT TREAT LACTATING DAIRY COWS OR DRY COWS WITHIN 21 DAYS OF FRESHENING

FLAMMABLE

KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME INCLUDING HOT BRANDING IRON AND CAUTERY DEHORNING

WARBEX®

FAMPHUR

POUR-ON CATTLE INSECTICIDE

13.2%

FOR CONTROL OF CATTLE GRUBS AND REDUCTION OF LICE INFESTATIONS

FOR LICE CONTROL
[illegible]

PRECAUTION
[illegible]

[illegible] **WARBEX** [illegible]

[illegible] **DO NOT TREAT BRAHMAN BULLS**

WARNING!
WARBEX [illegible] **WARBEX** [illegible]

DISPOSAL OF CONTAINERS Drain container completely. Add ¼ gallon water, ¼ cup of detergent and ¼ pound of lye. Tighten closure. Rotate to wet all surfaces and let stand for at least 15 minutes. Drain completely and rinse several times with water. Bury rinse solution at least 18 inches deep in an isolated area away from water supplies. Tighten closure. Puncture and crush container to prevent reuse. Bury deeply in an isolated location with 18 inches of cover.

Toxic to fish, birds and other wildlife. Keep out of lakes, ponds and streams. Do not apply to areas where run-off occurs. Do not contaminate water by cleaning of equipment or disposal of wastes. Apply this product only as specified on this label.

DIRECTIONS FOR USE
Pour **WARBEX** at the rate of 1 ounce per 200 pounds body weight from the shoulder to the tail head. Follow the suggested schedule below.

AV. CATTLE WEIGHT	DOSAGE	ONE GALLON TREATS
200 lbs	1 oz	128 head
400 lbs	2 ozs	64 head
600 lbs	3 ozs	42 head
800 lbs. & over	4 ozs	32 head

One treatment with **WARBEX** will effectively control cattle grubs and reduce cattle lice infestations.

FOR GRUB CONTROL:
Apply as soon as possible after heel fly activity ceases. It is important to treat before the grub larvae reach the gullet or spinal area as rapid kill of large numbers of larvae may possibly cause a host parasite reaction. As a general guide, treatment should be applied to cattle in or from the following areas as shown below:

Southwestern states — April/May
Southern states — June/July
Central states — August/September
Northern states — October/November

CYANAMID

FIRST AID:
IF POISONING SHOULD OCCUR,
CALL A PHYSICIAN.

NOTE TO PHYSICIANS: This product may cause cholinesterase inhibition. Atropine is antidotal. Pralidoxime chloride (2-P.A.M., Protopam chloride) may be effective as an adjunct to atropine. Use according to label directions.

WARNING!
KEEP OUT OF REACH OF CHILDREN
See Side Panel For Antidote And Other Warnings

Active ingredients	
O,O-dimethyl O-[p-(dimethylsulfamoyl)phenyl] phosphorothioate*	13.2%
Xylene	46.2%
Inert ingredients	40.6%

*Famphur (1 Gallon contains 1.04 pounds of Famphur)

PRECAUCION AL USUARIO: [illegible]
(TO THE USER: [illegible]

DISCLAIMER
American Cyanamid Company warrants that the material contained herein conforms to the chemical description on the label and is fit for the use therein described when used in accordance with the directions on the label. Any damages arising from a breach of this warranty shall be limited to direct damages and shall not include consequential commercial damages such as loss of profits or values, etc. BUYER assumes the risk of any use contrary to label instructions.

Consult your veterinarian, extension entomologist or county agent to confirm the best time for application in your area.

Treatment within 6-8 weeks of grub emergence will be less effective and carcass damage may result from dead grubs.

Treatment is less effective on wet animals or animals exposed to rain after treatment.

Control No. See top of can
Expiration Date

*Trademark

NET CONTENTS: 1 GALLON

08514-73

D8

Sold By
AGRICULTURAL DIVISION
AMERICAN CYANAMID COMPANY
WAYNE, N.J. 07470

Control No. Exp. Date
See top of can

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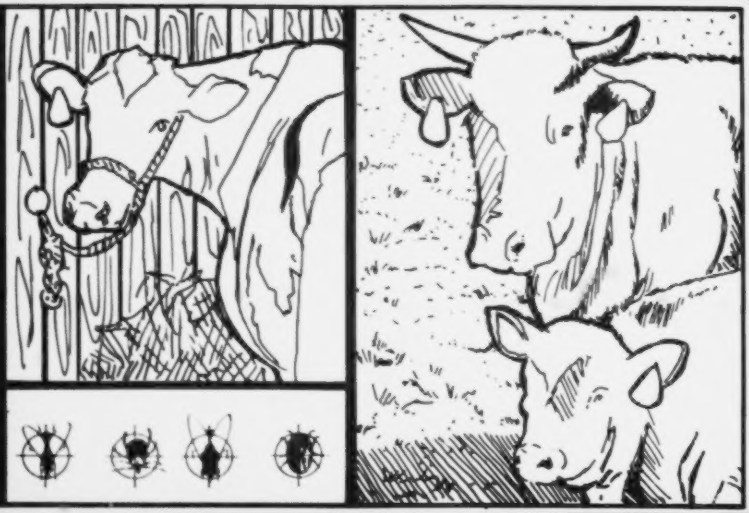
FEARING

DECKEM™

INSECTICIDE EAR TAGS

APPROVED FOR USE ON BEEF CATTLE, CALVES, AND ALL DAIRY CATTLE, INCLUDING LACTATING COWS.

CONTENTS: 24 EAR TAGS



For beef and lactating dairy cows

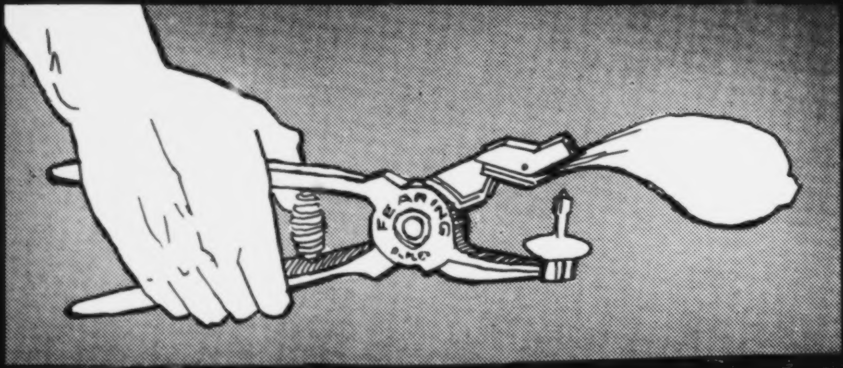
(No withdrawal period)

UP TO 5 MONTHS
FLY AND
TICK CONTROL

- **More pounds of beef**

817

Safe and fast application



- **More pounds of milk**
- **Heavier calves at weaning**

* Insecticide resistance may reduce effectiveness in some areas

FEARING MANUFACTURING COMPANY, INC.
490 VILLAUME AVE., SOUTH ST. PAUL, MN 55075 ● 612/455-1621

FEARING DECKEM INSECTICIDE EAR TAGS

For Use on Dairy and Beef Cattle and Calves to Control Horn Flies, Face Flies, Gulf Coast Ticks, Spinose Ear Ticks and as an Aid to Control Stable Flies, House Flies, and Lice on Cattle.

ACTIVE INGREDIENT Permethrin (3-phenoxyphenyl) methyl (±)-cis, trans-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate*	10.0%
INERT INGREDIENTS	90.0%
	100.0%

*cis trans ratio Max 55% (±) cis and min 45% (±) trans

KEEP OUT OF REACH OF CHILDREN
CAUTION

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS (AND DOMESTIC ANIMALS)
CAUTION

Wash thoroughly with soap and water after handling and before eating or smoking Avoid contamination of feed and foodstuffs

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish Do not add directly to water Do not contaminate water by disposal of used tags Use this product only as specified on this label

CONSIDERATIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling For control of horn flies, attach one tag to one ear of each animal in each herd Tags remain effective up to 5 months For control of Gulf Coast Ticks and face flies, attach two ear tags per animal (one in each ear) Apply when flies appear in economic levels Replace as necessary Apply with Fearing DuFlex Applicator

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal
STORAGE Store in cool place away from direct sunlight

PESTICIDE DISPOSAL Remove tags before slaughter Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility

CONTAINER DISPOSAL Dispose of empty bag in a sanitary landfill or by incineration or, if allowed by State and local authorities, by burning If burned, stay out of smoke

NET WT. 9.5 GRAMS PER TAG
CONTENTS: 24 TAGS

EPA EST. 44716-MN-1
EPA REG. 44716-1

818

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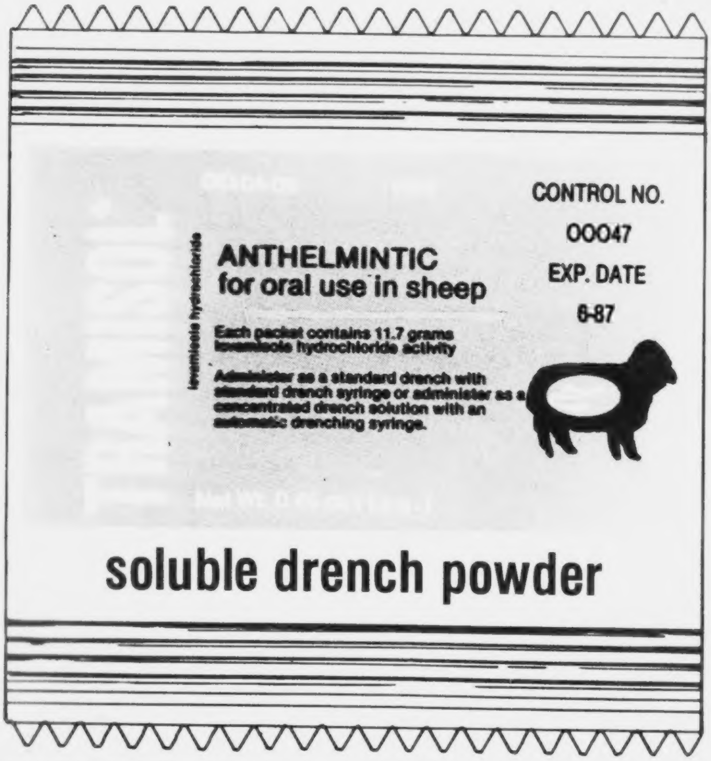
ASSIGNMENT SHEET #3



levamisole hydrochloride

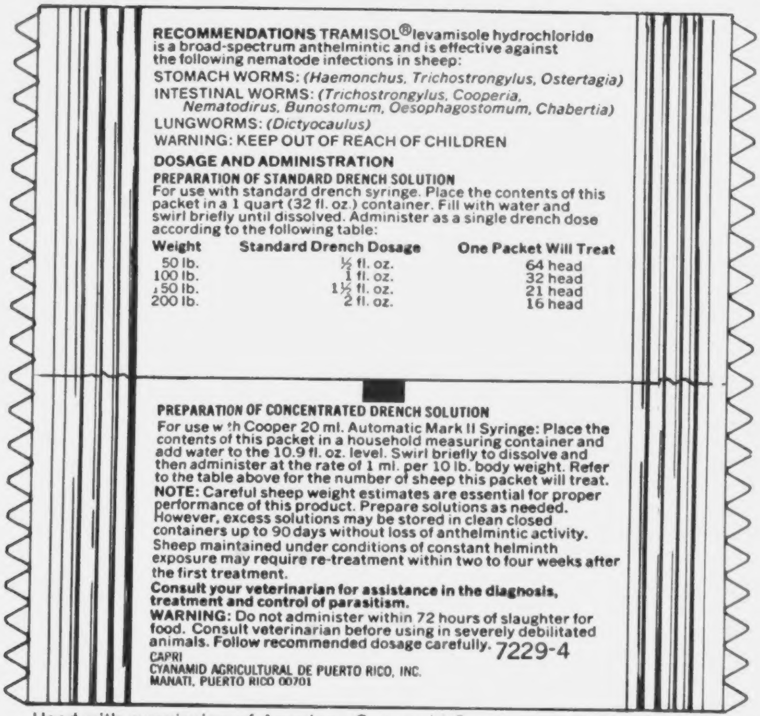
ANTHELMINTIC
for oral use in sheep

Each packet contains 11.7 grams levamisole hydrochloride activity

Administer as a standard drench with standard drench syringe or administer as a concentrated drench solution with an automatic drenching syringe.

CONTROL NO.
00047
EXP. DATE
6-87

soluble drench powder



RECOMMENDATIONS TRAMISOL® levamisole hydrochloride is a broad-spectrum anthelmintic and is effective against the following nematode infections in sheep:

STOMACH WORMS: *(Haemonchus, Trichostrongylus, Ostertagia)*

INTESTINAL WORMS: *(Trichostrongylus, Cooperia, Nematodirus, Bunostomum, Oesophagostomum, Chabertia)*

LUNGWORMS: *(Dictyocaulus)*

WARNING: KEEP OUT OF REACH OF CHILDREN

DOSAGE AND ADMINISTRATION

PREPARATION OF STANDARD DRENCH SOLUTION

For use with standard drench syringe. Place the contents of this packet in a 1 quart (32 fl. oz.) container. Fill with water and swirl briefly until dissolved. Administer as a single drench dose according to the following table:

Weight	Standard Drench Dosage	One Packet Will Treat
50 lb.	½ fl. oz.	64 head
100 lb.	1 fl. oz.	32 head
150 lb.	1½ fl. oz.	21 head
200 lb.	2 fl. oz.	16 head

PREPARATION OF CONCENTRATED DRENCH SOLUTION

For use with Cooper 20 ml. Automatic Mark II Syringe: Place the contents of this packet in a household measuring container and add water to the 10.9 fl. oz. level. Swirl briefly to dissolve and then administer at the rate of 1 ml. per 10 lb. body weight. Refer to the table above for the number of sheep this packet will treat.

NOTE: Careful sheep weight estimates are essential for proper performance of this product. Prepare solutions as needed. However, excess solutions may be stored in clean closed containers up to 90 days without loss of anthelmintic activity.

Sheep maintained under conditions of constant helminth exposure may require re-treatment within two to four weeks after the first treatment.

Consult your veterinarian for assistance in the diagnosis, treatment and control of parasitism.

WARNING: Do not administer within 72 hours of slaughter for food. Consult veterinarian before using in severely debilitated animals. Follow recommended dosage carefully. 7229-4

CAPRI
CYANAMID AGRICULTURAL DE PUERTO RICO, INC.
MANATI, PUERTO RICO 00701

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CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

ASSIGNMENT SHEET #4 — CALCULATE MIXES AND DOSAGE LEVELS FOR ANIMAL HEALTH PRODUCTS

NAME ______________________________ SCORE ______________

There is an old saying that goes "If 3 cc are okay, then 6 cc will be that much better." The message conveyed by that statement should never be considered or practiced when you are calculating mixes or determining dosage levels for animal health products. The manufacturer of each health product has tested its product carefully and then printed mixing and dosage recommendations on the label of the product. As a user of the product, you must be as careful in calculating mixes and dosage levels as the manufacturer was in testing. This assignment sheet will give you practice in making those calculations.

PART I

Study the large animal GALLIMYCIN® injectable antibiotic label found at the end of this assignment sheet, and then answer the following questions. Show your work in the spaces provided when necessary.

A. How much antibiotic should be given to an 800-pound steer?

______________________ml

B. How much antibiotic should be given to a 100-pound dairy calf?

______________________ml

ASSIGNMENT SHEET #4

C. How much antibiotic should be given to a 600-pound dairy heifer?

__________________________ml

D. How much antibiotic should be given to a 35-pound baby pig?

__________________________ml

E. How much antibiotic should be given to a 150-pound feeder pig?

__________________________ml

F. How much antibiotic should be given to a 300-pound sow?

__________________________ml

ASSIGNMENT SHEET #4

G. How much antibiotic should be given to a 20-pound baby lamb?

__________________________ml

H. How much antibiotic should be given to a 150-pound replacement ewe lamb?

__________________________ml

I. How much antibiotic should be given to a 250-pound ewe?

__________________________ml

J. How much antibiotic should be given to a 300-pound ram?

__________________________ml

ASSIGNMENT SHEET #4

PART II

Study the PROLATE® lice and mange spray label at the end of this assignment sheet, read the case study below, and then answer the following questions. Show your work in the spaces provided.

> The label on the PROLATE® lice and mange spray states that to control lice and mange, you need to mix 1 quart of insecticide with 25 gallons of water and then apply about 1 quart of diluted spray per animal. You intend to treat eight animals: three adult brood sows and five 200-pound show barrows. You do not need 25 gallons of mixture for your eight head of hogs.
>
> (NOTE: Assume that the quart of insecticide will treat 100 animals. Therefore, the ratio of the amount of insecticide [1 quart] to the amount of water [25 gallons or 100 quarts] would be 1:100. Also, remember that there are 32 fluid ounces in 1 quart.)

A. How much diluted spray mixture will you need for your eight animals?

_____________quarts or _____________ fl oz

B. How many fluid ounces of concentrated insecticide will you need for your eight animals?

_____________fl oz

C. How much water will you need to mix with the insecticide?

_____________fl oz or _____________ quarts

ASSIGNMENT SHEET #4

PART III

Study the SPOTTON® cattle insecticide label found at the end of this assignment sheet, read the case study below, and then answer the following questions. Show your work in the spaces provided.

> You need to treat your cattle for grub control, and you have selected Spotton® for their treatment. You have fifteen beef stocker steers that average 400 pounds each, a beef cow that weighs 1000 pounds, a 1500-pound bull, and a 1200-pound lactating dairy cow. You need to determine how much SPOTTON® solution you will need for these animals.
>
> (HINT: Be sure to read the caution statement on the label.)

A. How much SPOTTON® will you need to treat the stocker steers?

_______________cc

B. How much SPOTTON® will you need to treat the 1000-pound beef cow?

_______________cc

ASSIGNMENT SHEET #4

C. How much SPOTTON® will you need to treat the 1500-pound bull?

______________cc

D. How much SPOTTON® will you need to treat the 1200-pound lactating dairy cow?

______________cc

ASSIGNMENT SHEET #4

GALLIMYCIN

Gallimycin Injectable is Abbott's erythromycin formula for the treatment of certain major livestock diseases. It offers important advantages in disease management . . .

1. Gallimycin is one of the most effective antibiotic treatments for Shipping Fever, Respiratory Diseases (see chart), and certain other animal diseases.
2. Only one dose daily is needed.
3. If used early, clinical response often occurs after one or two injections.
4. Disease germs have little resistance to Gallimycin. This powerful disease-fighter is fully effective against many infectious organisms that have developed resistance to other antibiotics.
5. Gallimycin has a wide range of activity. Gallimycin is very active against the important bacterial organisms causing Shipping Fever, Pneumonia and Respiratory Diseases (see chart).
6. Fast acting! Effective blood levels in one to two hours. The fastest and most effective way to fight disease is to build up drug levels in the bloodstream that are high enough to combat disease germs. Gallimycin does it!
7. It's safe—no significant reactions or toxicity, even at levels considerably higher than needed to treat disease.

HOW TO USE

Gallimycin is designed for deep injection into the heavy muscles of the neck or legs. Where more than one treatment is needed, change the site of injection. Use a 16 or 18 gauge needle.

	WHEN To Use	HOW MUCH To Use	HOW OFTEN To Use	WHERE To Use	CAUTIONS
BEEF CATTLE	Shipping Fever Pneumonia (or pneumonia-enteritis complex) Food Rot Stress (handling, transporting to feedlot, vaccination, dehorning, etc) Metritis	Inject 0 5–1 ml per 100 lbs For example 100 lb calves: 5–1 ml 300 lb calves: 1 5–3 ml 500 lb calves: 2 5–5 ml 1000 lb steers: 5 0–10 0 ml	1 dose daily as needed	Inject deep into neck or "round" muscle tissue Use 2-inch needles —16 or 18 gauge	Cattle must not be treated within 14 days of slaughter for food
DAIRY CATTLE	Pneumonia Foot Rot Metritis Shipping Fever Stress (handling, transporting to and from pasture, etc)	Inject 5–1 0 ml per 100 lbs For example 50 lb calf: 25–50 ml 100 lb calves: 50–1 0 ml 800 lb calves: 4 0–8 0 ml Each additional 100 lbs: 50–1 0 ml	1 dose daily as needed	Inject deep into neck or "round" muscle tissue Use 2-inch needles —16 or 18 gauge	**Warning**: Milk that has been taken from animals during treatment & for 72 hours (6 milkings) after the latest treatment must not be used for food **NOTE**: Some antibiotics require longer withholding periods Cattle must not be treated within 14 days of slaughter for food
SWINE	**SWINE (HOGS)** Pneumonia Rhinitis Bronchitis **SOWS** Metritis Leptospirosis* (at farrowing time)	Inject 5–1 5 ml per 100 lb pig	1 dose daily as needed	Inject deep into muscle tissue—**not fat**. Use 2-inch needles —18 gauge — for best results	Swine must not be treated within 7 days of slaughter for food
	BABY PIGS (one week of age or older) "Scours"	Inject 25 ml per 5 lbs of body weight	1 dose daily as needed	Inject deep into ham muscle (see illustration opposite precautions) Use ¾ to 1-inch needles—18 or 19 gauge —for best results	
SHEEP	Prevention of "dysentery"** in newborn lambs Upper Respiratory Infections	Inject 25 ml per 10 lbs of body weight Older Animals Inject 50 ml per 100 lbs of weight	1 dose daily as needed	Inject deep into muscle tissue Use 1- or 2-inch needles —16 or 18 gauge — for best results	Sheep must not be treated within 3 days of slaughter for food

*In most states, leptospirosis is a reportable disease because of its public health significance. When this disease is suspected, professional advice should be sought

**Where organisms susceptible to erythromycin may be the infective agent

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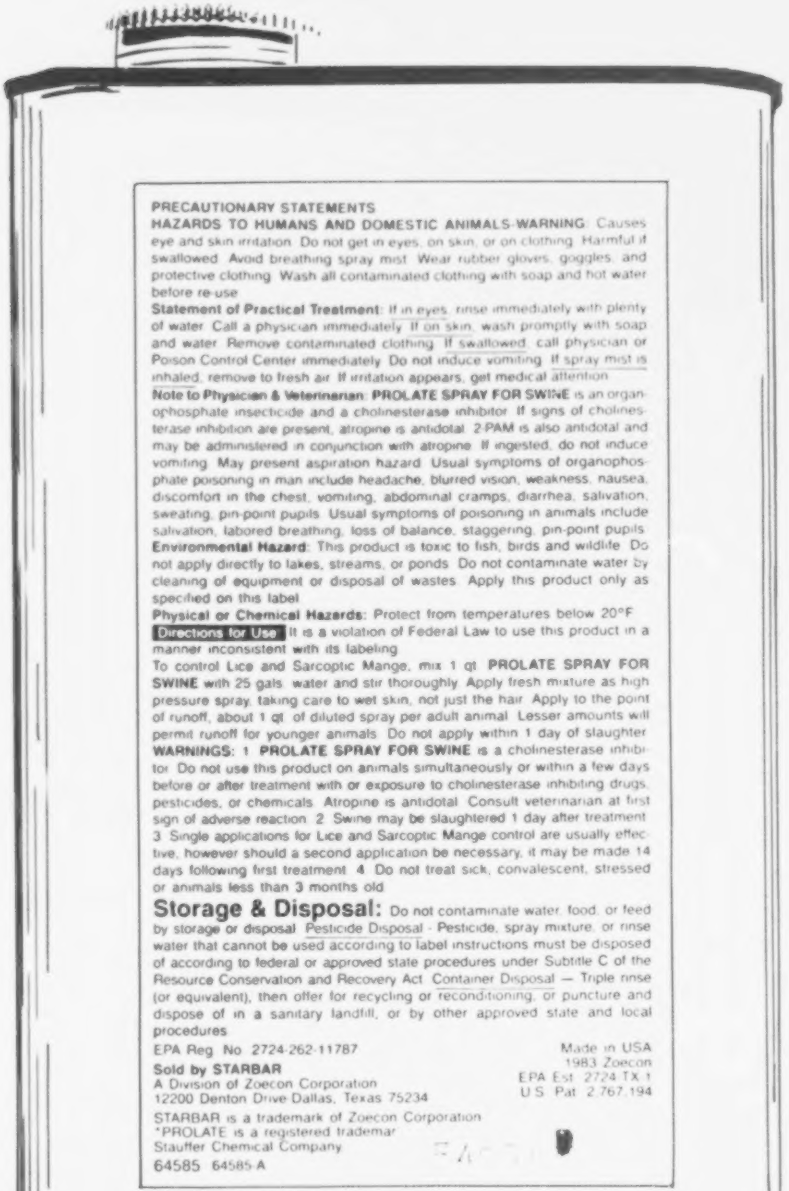
ASSIGNMENT SHEET #4

Prolate® Lice and Mange Spray for Swine



PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS-WARNING: Causes eye and skin irritation Do not get in eyes, on skin, or on clothing Harmful if swallowed Avoid breathing spray mist Wear rubber gloves, goggles, and protective clothing Wash all contaminated clothing with soap and hot water before re-use

Statement of Practical Treatment: If in eyes, rinse immediately with plenty of water Call a physician immediately If on skin, wash promptly with soap and water Remove contaminated clothing If swallowed, call physician or Poison Control Center immediately Do not induce vomiting If spray mist is inhaled, remove to fresh air If irritation appears, get medical attention

Note to Physician & Veterinarian: **PROLATE SPRAY FOR SWINE** is an organophosphate insecticide and a cholinesterase inhibitor If signs of cholinesterase inhibition are present, atropine is antidotal 2-PAM is also antidotal and may be administered in conjunction with atropine If ingested, do not induce vomiting May present aspiration hazard Usual symptoms of organophosphate poisoning in man include headache, blurred vision, weakness, nausea, discomfort in the chest, vomiting, abdominal cramps, diarrhea, salivation, sweating, pin-point pupils Usual symptoms of poisoning in animals include salivation, labored breathing, loss of balance, staggering, pin-point pupils

Environmental Hazard: This product is toxic to fish, birds and wildlife Do not apply directly to lakes, streams, or ponds Do not contaminate water by cleaning of equipment or disposal of wastes Apply this product only as specified on this label

Physical or Chemical Hazards: Protect from temperatures below 20°F

Directions for Use: It is a violation of Federal Law to use this product in a manner inconsistent with its labeling

To control Lice and Sarcoptic Mange, mix 1 qt **PROLATE SPRAY FOR SWINE** with 25 gals water and stir thoroughly Apply fresh mixture as high pressure spray, taking care to wet skin, not just the hair Apply to the point of runoff, about 1 qt of diluted spray per adult animal Lesser amounts will permit runoff for younger animals Do not apply within 1 day of slaughter

WARNINGS: 1 **PROLATE SPRAY FOR SWINE** is a cholinesterase inhibitor Do not use this product on animals simultaneously or within a few days before or after treatment with or exposure to cholinesterase inhibiting drugs, pesticides, or chemicals Atropine is antidotal Consult veterinarian at first sign of adverse reaction 2 Swine may be slaughtered 1 day after treatment 3 Single applications for Lice and Sarcoptic Mange control are usually effective, however should a second application be necessary, it may be made 14 days following first treatment 4 Do not treat sick, convalescent, stressed or animals less than 3 months old

Storage & Disposal: Do not contaminate water, food, or feed by storage or disposal Pesticide Disposal - Pesticide, spray mixture, or rinse water that cannot be used according to label instructions must be disposed of according to federal or approved state procedures under Subtitle C of the Resource Conservation and Recovery Act Container Disposal — Triple rinse (or equivalent), then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other approved state and local procedures

EPA Reg No 2724-262-11787

Made in USA
1983 *Zoecon*
EPA Est 2724 TX 1
U S Pat 2,767,194

Sold by STARBAR
A Division of Zoecon Corporation
12200 Denton Drive Dallas, Texas 75234

STARBAR is a trademark of Zoecon Corporation
*PROLATE is a registered trademar
Stauffer Chemical Company
64585 64585-A

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80136606

SINCE
CUTTER
1897

SPOTTON®

Brand of fenthion

CATTLE INSECTICIDE

20% Ready-To-Use Solution
FOR CONTROL OF CATTLE GRUBS
AND AS AN AID IN CONTROLLING LICE

Directions for Use

Beef Cattle and Dairy Cattle Not of Breeding Age: SPOTTON (fenthion) Cattle Insecticide 20% Ready-To-Use Solution requires no further dilution. A single, properly-timed application placed in **one spot** on the backline of an animal gives effective control of cattle grubs and this will also aid in control of lice. A second application will be required for animals heavily infested with lice or for those animals which become re-infested. A SECOND APPLICATION FOR LOUSE CONTROL SHOULD BE MADE NO SOONER THAN 35 DAYS AFTER THE FIRST TREATMENT.

AMOUNT TO USE: Apply SPOTTON 20% Ready-To-Use Solution at the rates shown in the following table. Due to the small amount of material required, care must be taken to apply the proper dose. Only one, properly-timed application per season is required for grub control.

Weight of Animal	Amount of SPOTTON 20% Solution per animal
150-300 lbs.	4 cc
301-600 lbs.	8 cc
601-900 lbs.	12 cc
901-1200 lbs.	16 cc
Over 1200 lbs.	20 cc

APPLICATOR: SPOTTON 20% Ready-To-Use Solution can be applied using the automatic applicator gun or Squeeze-A-Spot™ Applicator designed exclusively for use with this formulation. The applicators are available from your SPOTTON Insecticide Dealer. SPOTTON Insecticide can also be applied with certain other available syringes that can be calibrated to deliver the required dosage. Consult your dealer for information regarding a suitable syringe since SPOTTON Solution will damage the components of some syringes.

NOTE: If not properly cared for, syringes may be damaged resulting in improper application. O-rings and any other moving parts of rubber or neoprene will swell after prolonged contact with the solution. Prompt cleaning after each day's use is essential. Glass or metal syringe barrels are recommended since some types of plastic are damaged by SPOTTON Solution.

HOW TO APPLY: Replace regular cap on container with the special dispenser tube cap provided. Attach the connecting hose to the applicator gun and to the dispenser tube on the container. Adjust the applicator gun to the desired dose. Apply the solution to a **single location** on the midline of the animal's back holding the applicator gun between 4 and 6 inches from the animal.

When treatment has been completed, drain any solution remaining in applicator and hose back into container. Close container tightly with original cap.

CLEANING APPLICATOR GUN: Do not allow the SPOTTON Solution to remain in the connecting hose or applicator gun overnight. After each day's use, drain applicator gun and hose and then wash thoroughly by pumping 2 to 4 ounces of vegetable oil (soybean or corn cooking oil or castor oil) through the system. After the oil wash, pump 2 to 4 ounces of clean water through system. This water rinse will remove the excess oils but leave a lubricating oil film on all parts.

Wash hands thoroughly with soap and warm water after cleaning applicator.

WHEN TO TREAT FOR GRUB CONTROL: Proper timing of treatment is important. For most effective results, cattle should be treated as soon as possible after heelfly activity ceases. Host-parasite reactions such as bloat, salivation, staggering and paralysis, may sometimes occur when cattle are treated while the common cattle grub (*Hypoderma lineatum*) is in the gullet, or while the northern cattle grub (*H. bovis*) is in the area of the spinal cord. Cattle should be treated **before** these stages of grub development. Consult your veterinarian, extension livestock specialist, or extension entomologist regarding the timing of treatment.

NOTE: If it is impossible to determine the origin of the cattle, and thus the exact stage of the grubs is unknown, it is recommended that the cattle receive only a maintenance ration of low energy feed during the treatment period. This lessens the likelihood of severe bloat which may occur in cattle on full feed when the common grub is killed while in the gullet.

WHEN TO TREAT FOR LICE CONTROL:
For Cattle NOT Previously Treated for Grubs — Follow recommendations under **When To Treat For Grub Control** to avoid host-parasite reactions. **For Cattle Previously Treated for Grubs** — Cattle which have been previously treated for grub control with a systemic insecticide may again be treated later in the season should lice become a problem. The second treatment should not be applied sooner than 35 days after the first treatment.

CAUTION

Do not treat calves less than 3 months old, sick, convalescent, or severely stressed livestock. *This product is intended for use on beef cattle and non-lactating dairy cattle only. Apply this product only as specified on this label.* Do not treat cattle for 10 days before or after shipping, weaning, or dehorning or after exposure to contagious or infectious diseases.

➔ **WARNING: DO NOT SLAUGHTER WITHIN 45 DAYS OF TREATMENT. DO NOT TREAT DAIRY CATTLE OF BREEDING AGE.** ⬅

WARNING: SPOTTON (fenthion) 20% Ready-To-Use Solution is a cholinesterase inhibitor. Do not use this product on animals simultaneously with or within a few days before or after treatment with or exposure to cholinesterase inhibiting drugs, pesticides or chemicals.

NOTE: Acute symptoms of overdosage in cattle are frequent defecation, urination, lacrimation, and muscular twitching. Later symptoms are salivation, diarrhea and muscular weakness.

NOTICE TO VETERINARIAN: If the proper dosage of SPOTTON 20% Ready-To-Use Solution has been applied and adverse reactions, such as bloat, excessive salivation, and posterior paralysis occur, it is highly probable that a host-parasite reaction exits. Administer symptomatic treatment. Anti-inflammatory agents may be helpful. If necessary, relieve bloat by trocarization, as a stomach tube may traumatize a severely swollen esophagus. Do **not** administer atropine, as it is contraindicated in host-parasite reactions. If toxicity should occur as a result of gross overdosage, atropine is antidotal.

Available in both one-pint and six-pint containers.

USE ONLY AS DIRECTED

CUTTER ANIMAL HEALTH
Mobay Corporation Animal Health Division
Shawnee, Kansas 66201, U.S.A.

[illegible]
[illegible] U.S.A.

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CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

A. 1. Horsefly
   2. Keep animals from heavy brush areas; no totally effective spray is available, but frequent spraying for flies helps from May until frost; use Pyrethrins

B. 1. Blowfly
   2. Use proper procedure for destroying dead animals; use traps, poisoned baits, and repellents

C. 1. Lungworms
   2. Practice good sanitation; do not spread infested manure on pasture; use parasiticide

D. 1. Coccidia
   2. Avoid contaminated feed and water; isolate affected animals; keep feeders and waterers sanitary; consult veterinarian; use coccidiastats

E. 1. Gastrointestinal worms
   2. Rotate pastures; isolate calves and lambs from adult animals; keep feeders and waterers sanitary; use parasiticides

F. 1. Ascarid
   2. Clean farrowing quarters; wash sows before farrowing; place sows on clean pasture after farrowing; use parasiticide

G. 1. Liver flukes
   2. Avoid wet pastures; use drench of flukacide

H. 1. Tick
   2. Spray or dust frequently; use Malathion or other current market parasiticide

I. 1. Louse
   2. Spray frequently from October until spring; use Co-Ral, Malathion, or other appropriate parasiticide

ANSWERS TO ASSIGNMENT SHEETS

J. 1. Mite
   2. Spray or dip animal with lime sulfur

K. 1. Grub (heel fly)
   2. Control flies between June and October; use systemic grub-control insecticide, but not after October 15

Assignment Sheet #2

A. 1. Milk fever
   2. Keep good supply of vitamins and minerals available; feed a high-phosphorous, low-calcium diet during last ten to fourteen days of pregnancy; treat with injections of calcium glucose given intravenously

B. 1. Cancer eye
   2. Early diagnosis followed by surgery or treatment with an electronic device

C. 1. Erysipelas
   2. Isolate sick animal; clean and disinfect pen; give antibiotics; vaccinate once or twice a year

D. 1. Swine influenza
   2. Provide warm, clean, well-ventilated quarters and ample supply of fresh water; use antibiotics

E. 1. Shipping fever
   2. Provide good feeding and management; vaccinate three weeks before stressing cattle; isolate infected animals; treat with antibiotics

F. 1. Pinkeye
   2. Isolate affected animal; treat with antibiotics; provide good nutrition, including vitamin A

G. 1. Pneumonia
   2. Isolate infected animal and treat with sulfa drugs and antibiotics; practice good, sound husbandry and provide good hygenic surroundings

H. 1. Mastitis
   2. Eliminate source of udder injury; provide clean bedding; treat with antibiotics

ANSWERS TO ASSIGNMENT SHEETS

I. 1. Warts
   2. Isolate infected cattle; clean and disinfect pens; vaccinate or remove warts surgically

J. 1. Bloat
   2. Feed dry hay before putting animal on green, lush pasture; change feed; treat affected animal by giving defoaming agents such as peanut oil, corn oil, or soybean oil by stomach tube; keep animal on feet and moving

K. 1. Prussic acid poisoning
   2. Keep cattle from grazing on frost- or drought-damaged Johnson grass or Sudan grass; treat promptly with nitrate boluses

L. 1. Founder
   2. Avoid overfeeding and overdrinking; destroy severe cases; stand animal's feet in cold-water bath until vet arrives

M. 1. Red nose (infectious bovine rhinotracheitis)
   2. Practice good sanitation; isolate infected animal; vaccinate; no specific treatment, but give sulfonamides and antibiotics to combat secondary infections

N. 1. Transmissible gastroenteritis (TGE)
   2. Move and scatter sows that have not farrowed; avoid continuous farrowing; isolate new additions to herd; practice good feeding and management; no effective treatment, but give antibiotics or sulfonamides to prevent secondary infection

O. 1. Atrophic rhinitis
   2. Select breeding stock from herds known to be clean; use clean farrowing quarters; treat with sulfonamide drugs

P. 1. Brucellosis
   2. No treatment known; slaughter infected animal; vaccinate calves; clean areas of infection thoroughly

Assignment Sheet #3

PART I

A. Pour-on cattle insecticide
B. 13.2 percent
C. No

ANSWERS TO ASSIGNMENT SHEETS

D. No, must wait thrity-five days
E. Agricultural Division, American Cyanamid Company, Wayne, New Jersey
F. June and July
G. One
H. Two ounces
I. Atropine

PART II

A. 10.0 percent
B. 9.5 grams
C. Store in cool place away from direct sunlight
D. Horn flies, face flies, Gulf Coast ticks, spinose ear ticks
E. 90.0 percent
F. Yes
G. Fearing Manufacturing Company Inc., St. Paul, Minnesota
H. Dispose of container in a sanitary landfill or burn
I. Wash hands with soap and water, avoid contamination of feed and foodstuffs

PART III

A. Sheep
B. Stomach worms, intestinal worms, and lungworms
C. One quart
D. Two fluid ounces
E. Thirty-two
F. Seventy-two hours
G. Ninety days
H. Follow recommended dosage carefully
I. Swirl until dissolved

Assignment Sheet #4

PART I

A. 4.0 to 8.0 ml
B. 0.5 to 1.0 ml
C. 3.0 to 6.0 ml
D. 1.75 ml
E. 0.75 to 2.25 ml
F. 1.5 to 4.5 ml
G. 0.5 ml
H. 0.75 ml
I. 1.25 ml
J. 1.5 ml

ANSWERS TO ASSIGNMENT SHEETS

PART II

A. 8 quarts; 256 fl oz
B. 2.56 fl oz
C. 256 fl oz; 8 quarts

PART III

A. 120 cc
B. 16 cc
C. 20 cc
D. 0 cc

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

JOB SHEET #1 — USE A DRENCH GUN

I. Equipment and materials

A. Drenching gun

B. Drench and manufacturer's recommendations

C. 3-gallon pail

D. Liquid disinfectant

E. Water

F. Sheep

II. Procedure

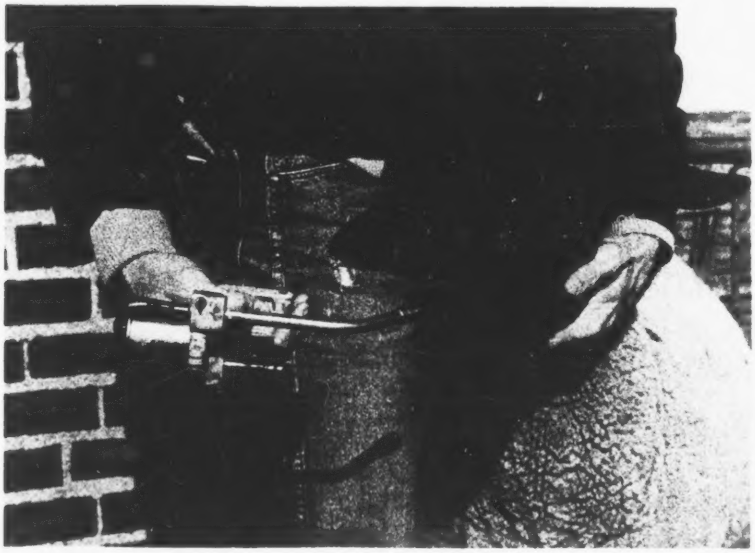
(NOTE: Be sure to follow manufacturer's label recommendations for proper dosage level for sheep being treated.)

A. Disinfect gun by placing it in container of liquid disinfectant

B. Catch sheep and restrain so that animal will not be able to escape or jump

C. Place one hand under sheep's jaw, and lift sheep's head (Figure 10)

FIGURE 10

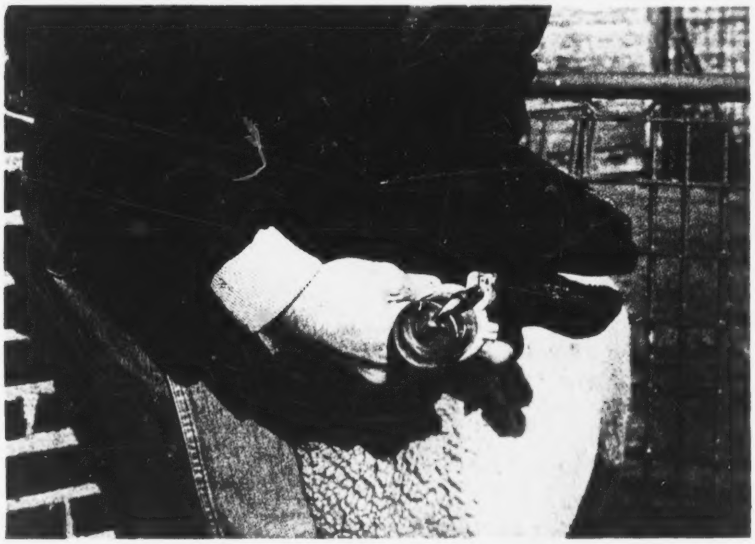


JOB SHEET #1

D. Hold drenching gun in other hand, and position gun's nozzle to the side of animal's mouth, over the tongue, and directed into the back part of the throat (Figure 11)

> **CAUTION**
>
> Take care to avoid damaging the lining of the animal's mouth and throat.

FIGURE 11



E. Push release trigger on gun to deposit drench at a moderate rate so that animal has time to swallow drench

> **CAUTION**
>
> Depositing the drench too fast could cause the animal to aspirate the fluid into its lungs through the trachea.

F. Release animal

G. Clean work area and store equipment and materials properly

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

JOB SHEET #2 — ADMINISTER WORM PASTE

I. Equipment and materials

A. Cattle-working chute

B. Paste wormer, loaded applicator gun, and manufacturer's recommendations

C. Cattle

II. Procedure

(NOTE: Be sure to follow manufacturer's label recommendations for proper dosage level for weight of cattle being wormed.)

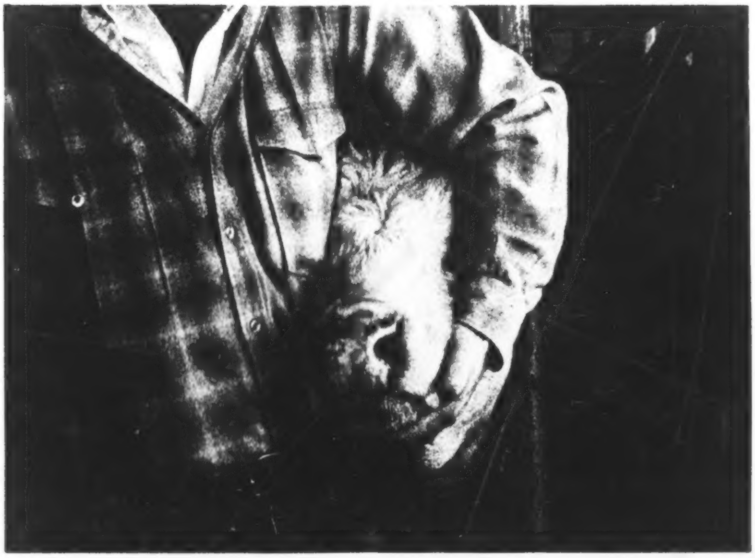
A. Secure animal in working chute so that animal will not be able to escape or injure itself or you (Figure 12)

FIGURE 12

B. Standing close to one side of animal's head, reach over top of animal's head and place your hand under front part of animal's jaw (See Figure 13)

JOB SHEET #2

FIGURE 13

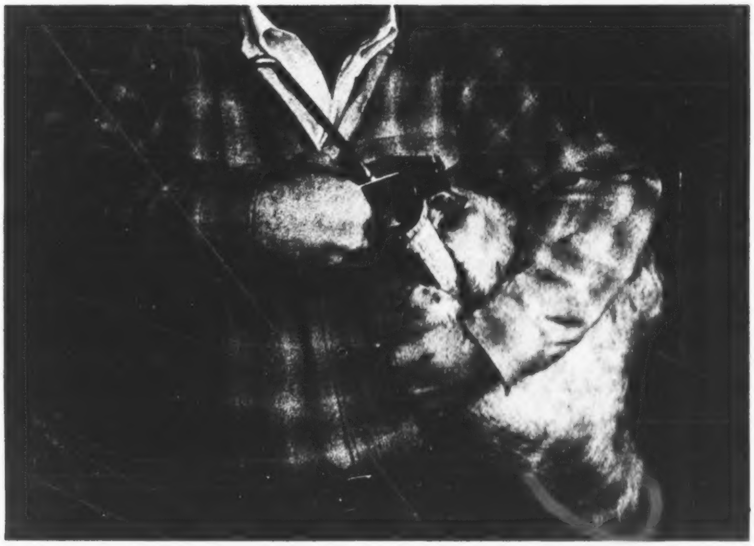


C. Holding loaded applicator gun in other hand, place nozzle of tube into animal's mouth so that it is well back into mouth and on center of tongue (Figure 14)

CAUTION

Take care to avoid damaging animal's teeth and lining of mouth and throat.

FIGURE 14



JOB SHEET #2

D. Squeezing gun's trigger the correct number of clicks, deposit correct dosage of paste for animal

E. Remove applicator gun from animal's mouth, and watch to see that animal swallows paste

F. Move away from animal, and then release animal from working chute

G. Clean work area and store equipment and materials properly

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

JOB SHEET #3 — ADMINISTER A BOLUS

I. Equipment and materials

  A. Cattle-working chute

  B. Balling gun

  C. Bolus and manufacturer's recommendations

  D. 3-gallon pail

  E. Water

  F. Disinfectant

  G. Cattle

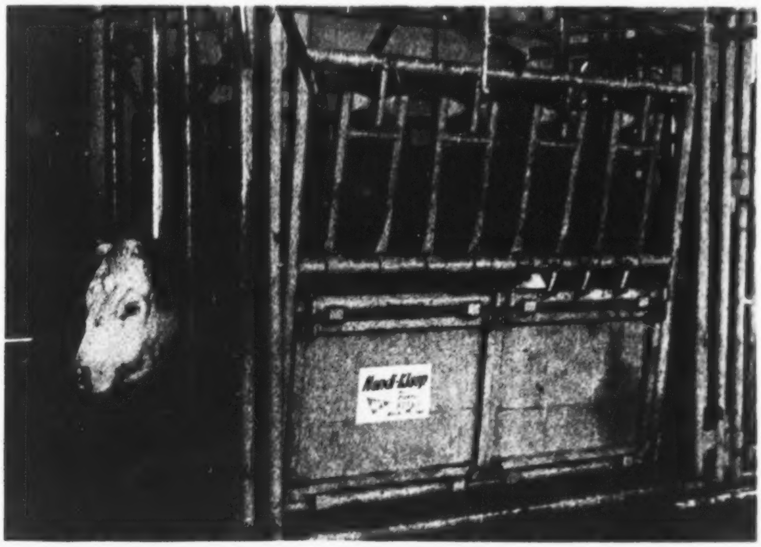
II. Procedure

  (NOTE: Be sure to follow manufacturer's label recommendations for proper dosage level for animal being treated.)

  A. Disinfect balling gun by dipping it in container of disinfectant

  B. Secure animal in working chute so that animal will not be able to jump (Figure 15)

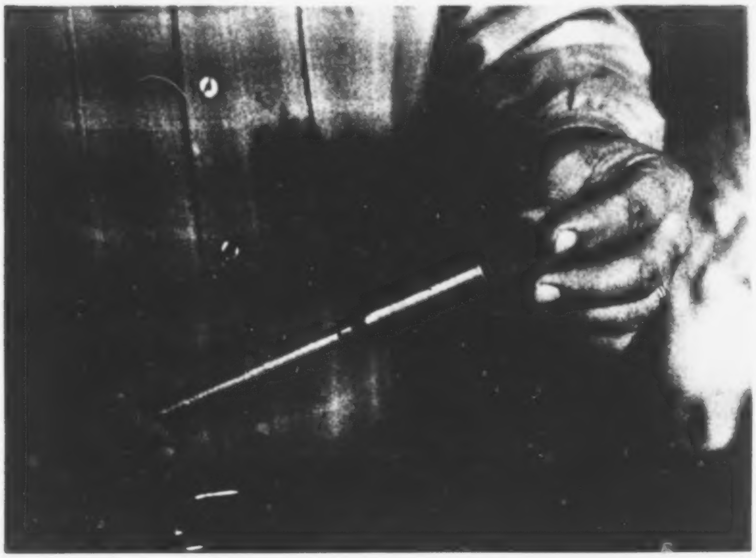
FIGURE 15



JOB SHEET #3

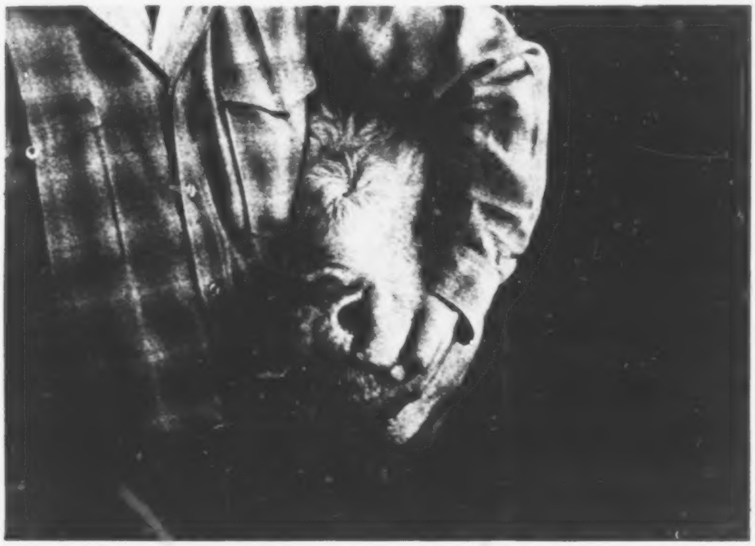
C. Place bolus in balling gun (Figure 16)

FIGURE 16



D. Standing close to one side of animal's head, reach over top of animal's head and place your hand beneath animal's mouth to lift animal's head (Figure 17)

FIGURE 17



JOB SHEET #3

E. Holding balling gun in other hand, place gun in animal's mouth through the side of the mouth, over the top of the tongue, and to the back of the throat (Figure 18).

CAUTION

Take care to avoid damaging the animal's teeth and the lining of the mouth and throat.

FIGURE 18

F. Push trigger mechanism of gun to release bolus

G. Remove gun from animal's mouth, and watch to see that animal swallows bolus

H. Move away from animal, and then release animal from working chute

I. Clean work area and store equipment and materials properly

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

JOB SHEET #4 — INSTALL INSECTICIDE EAR TAG

I. Equipment and materials

   A. Cattle-working chute
   B. Tag applicator
   C. Ear tag and manufacturer's recommendations
   D. 3-gallon pail
   E. Water
   F. Disinfectant
   G. Cattle

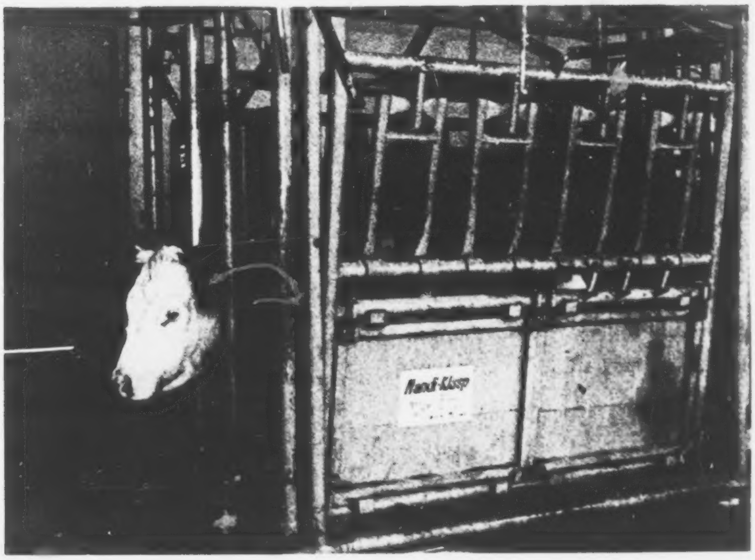
   (NOTE: Most manufacturers recommend that cattle weigh over 500 pounds before ear tags are used.)

II. Procedure

   A. Disinfect applicator and tag by placing in container of disinfectant
   B. Secure animal in working chute so that animal will not be able to move its head (Figure 19)

> **CAUTION**
> The animal's head must be restrained well enough to keep the animal from moving and splitting its ear when the tag is installed.

FIGURE 19



JOB SHEET #4

C. Remove applicator and tag from disinfectant

D. With collar on tag pointing down, place female part of tag under clip of applicator by depressing lever (Figure 20)

FIGURE 20

E. Slide male button of tag on pin until it projects through tip of applicator (Figure 21)

FIGURE 21

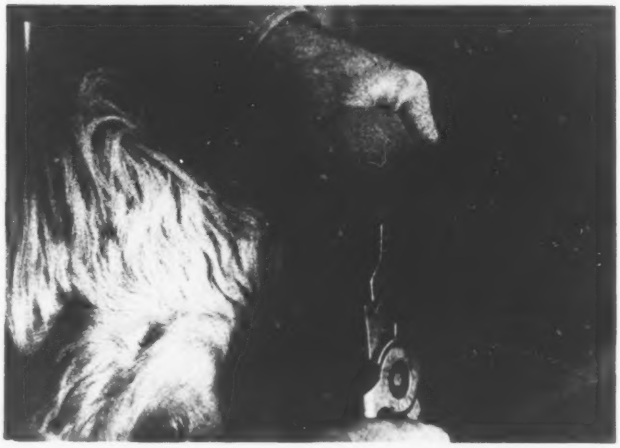
JOB SHEET #4

F. Position tag on flat surface in center of ear, where shaft of male button will not penetrate any cartilage rib or blood vessel (Figure 22)

CAUTION

Ear damage may result if the shaft of the male button is allowed to penetrate cartilage rib or blood vessel.

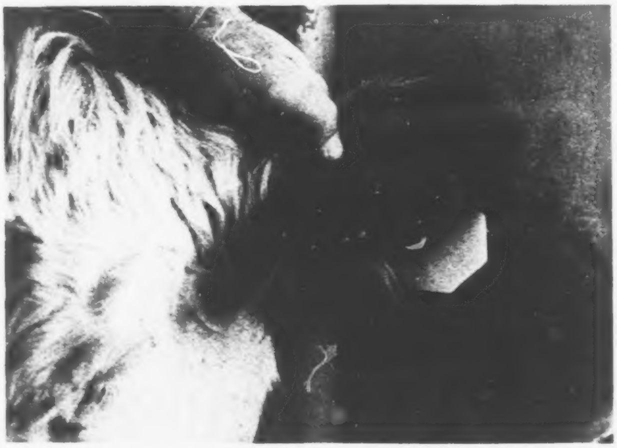
FIGURE 22



G. With a firm grip on handle of applicator, connect tag to ear by squeezing applicator handle

H. Check tag to see that proper connection has been made and that tag hangs properly (Figure 23)

FIGURE 23



JOB SHEET #4

I. Move away from animal, and then release animal from working chute

J. Clean work area and store equipment and materials properly

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

TEST

NAME ______________________________ SCORE ____________

1. Match to their correct definitions terms associated with animal parasites. Write the correct numbers in the blanks.

   _____a. Series of changes through which organism passes during its life

   _____b. Organism that lives on or under host animal's skin

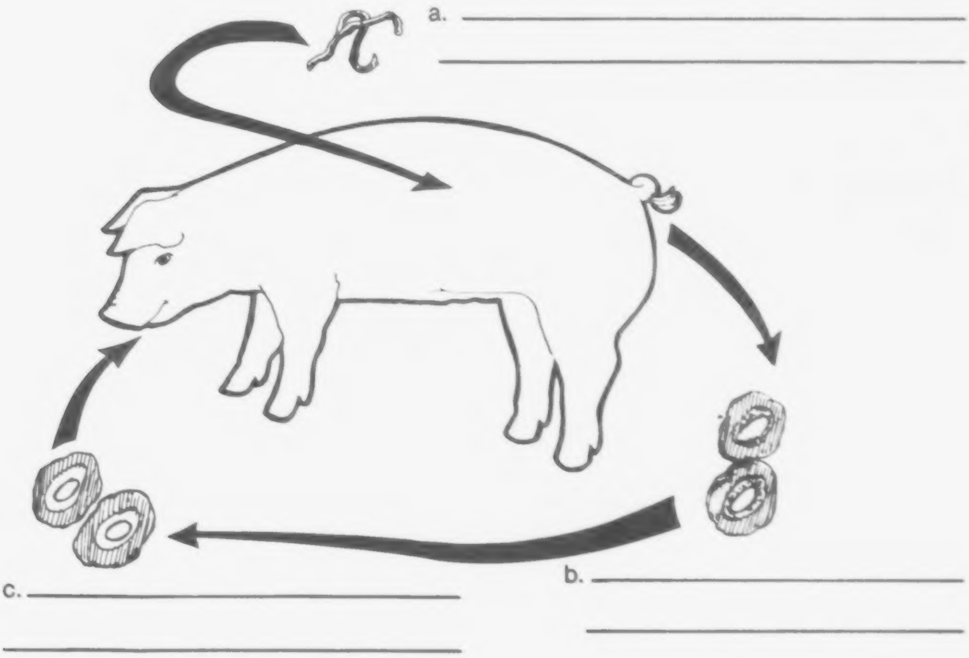
   _____c. Organism that lives in or on host animal and obtains food from host

   _____d. Change in form or structure of organism that occurs after birth or hatching

   _____e. Organism that lives part of its life cycle inside host animal's body

   1. Internal parasite
   2. External parasite
   3. Metamorphosis
   4. Life cycle
   5. Parasite

2. Label the following illustration of the life cycle stages of an internal parasite.



TEST

3. Match common internal parasites to their correct descriptions. Write the correct numbers in the blanks.

_____a. Worms that may infest the stomach of swine, cattle, sheep, and goats, but cause marked symptoms of unthriftiness and loss of appetite in goats and sheep

_____b. White, threadlike, $1\frac{1}{2}$- to 3-inch worms found in the trachea and bronchi of cattle, sheep, goats, and swine; cause coughing and labored breathing

_____c. Protozoan organisms that cause a disease known as coccidiosis, which produces diarrhea and bloody feces in cattle, sheep, goats, and poultry

_____d. Large, yellowish or pinkish roundworms found in swine; migrating larvae produce liver damage and lung lesions resulting in verminous pneumonia

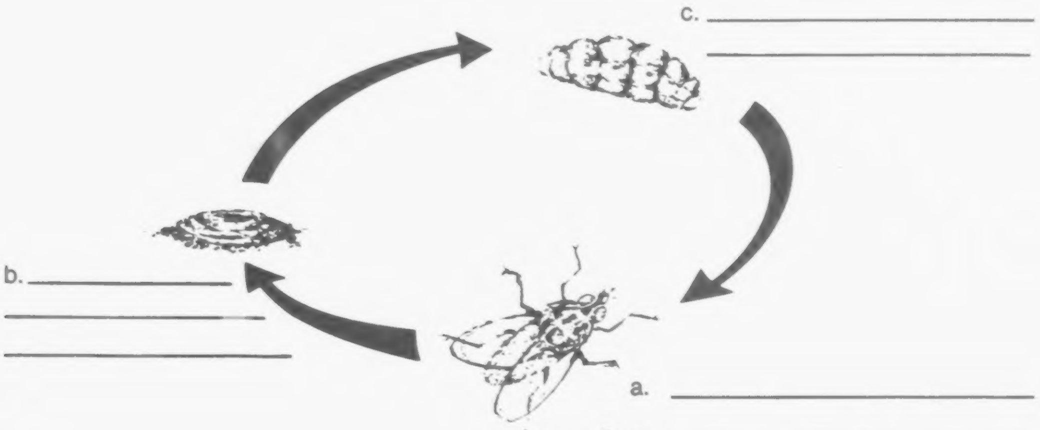
_____e. Any of many species of worms found in the stomach, small intestine, and colon of cattle, sheep, goats, poultry, horses, and swine; cause loss of weight, anemia, and/or diarrhea

_____f. Long, ribbonlike worms that infest the intestines of sheep, goats, and horses; may cause death in sheep and goats by blocking cystic duct, gallbladder, and ducts of liver and pancreas

_____g. Flattened, leaflike brown worms that are usually 1 inch long; cause severe liver damage in cattle, sheep, and goats

1. Coccidia
2. Gastrointestinal worms
3. Lungworms
4. Ascarid
5. Tapeworms
6. Stomach worms
7. Liver flukes

4. Label the following illustration of the life cycle stages of an external parasite.



TEST

5. Match common external parasites to their correct descriptions. Write the correct numbers in the blanks.

_____a. Any of a number of species of flies, all of which breed in the flesh of all farm animals, causing maggots to spread over host animal's body and feed on skin surface

_____b. Biting fly that attacks cattle and horses, inflicting a painful bite and causing heavily attacked animal to stop grazing

_____c. Small, flattened wingless parasite, most species of which are specific for a particular class of farm animal; causes intense irritation and restlessness and may cause severe itching

_____d. Small parasite, most species of which are specific for a particular class of farm animal; causes mange, a marked irritation and crusting over of the skin accompanied by formation of thick, tough, wrinkled skin

_____e. Fly that attacks the heels of cattle in early spring or summer, causing host animal to run madly with its tail over its back in an attempt to escape; larval stage causes conspicuous swelling in back of animal, usually from December to May

_____f. Small fly often found resting at base of horn on cattle; one of the most numerous and worst annoyances of cattle, causing tormented animal to refuse to graze during day and seek protection by hiding in dark buildings, brush, or tall grass

_____g. Any of several species that feed exclusively on blood; found on cattle and horses, a heavy infestation will cause host animal to lose weight and become anemic and unthrifty

1. Tick
2. Blowfly
3. Horn fly
4. Horsefly
5. Grub (heel fly)
6. Louse
7. Mite

TEST

6. Match to their correct definitions terms associated with animal diseases. Write the correct numbers in the blanks.

_____a. One-celled microorganisms that may be harmful and can be seen with a microscope

_____b. Condition apart from normal that prevents performance of vital functions or normal activity

_____c. Ultramicroscopic or submicroscopic organism or agent that causes disease

_____d. Any observable sign or evidence of disease

_____e. Communicable by contact

_____f. Unbalance of vital organs in animal's body

_____g. Disease not due to infection by a pathogen but resulting from physical or chemical agents or metabolic derangement

_____h. Disease resulting from infection caused by a pathogen; may or may not be contagious

_____i. Disease-producing organism

_____j. Expulsion of dead or immature fetus

_____k. Entry and development of a pathogen in or on animal's body

1. Disease
2. Pathogen
3. Infection
4. Contagious
5. Metabolic derangement
6. Infectious disease
7. Noninfectious disease
8. Symptom
9. Abortion
10. Bacteria
11. Virus

7. Match common infectious diseases to their correct descriptions. Write the correct numbers in the blanks. Terms and definitions continue on the following pages.

_____a. Viral or bacterial infection of cattle and sheep, especially lambs, brought on by environmental conditions creating stress; symptoms include high temperature, discharge from eyes and nose, hacking cough, difficulty in breathing, and possibly a swelling in the neck region

_____b. Disease seen in cattle, sheep, and goats; lameness is usually the first symptom, followed by hoof infection and a characteristic foul odor

_____c. One of the most serious and widespread bacterial diseases affecting cattle, goats, and swine, but rarely affecting sheep; abortion is the most characteristic symptom

1. Brucellosis (Bang's disease)
2. Shipping fever
3. Foot rot

TEST

______d. Acute or chronic bacterial disease usually seen in swine; in acute form affected animals show a high fever, edema of the nose, ears, and limbs, and possibly purplish patches under the belly

______e. Inflammation of udder seen in cattle, sheep, goats, and swine; in acute form, udder is hot, very hard, and tender; milk will be reduced greatly and may become lumpy or watery

______f. Bacterial disease caused by several species of corkscrew-shaped organisms; disease affects cattle, sheep, goats, swine, and horses; symptoms are usually mild in most animals; but losses occur from poor growth in beef cattle, loss of production in dairy cows, and abortion in swine

______g. Very infectious, highly fatal bacterial disease primarily affecting young cattle four months to two years old; symptoms include lameness and swelling, high fever, loss of appetite, and severe depression

______h. Inflammation of lungs seen in all animals; symptoms include quick, shallow respiration, crackling noises with breathing, and standing with legs wide apart

______i. Suddenly appearing, viral infection of swine; symptoms include high fever, loss of appetite, cough, and discharge from nose and eyes; animal may sit up like a dog to facilitate breathing

______j. Bacterial or viral eye ailment seen in cattle, sheep, and goats; symptoms include swelling of lining membrane of eyelids

______k. Bacterial disease caused by the bacterium *Vibrio fetus*, which affects sheep and cattle; symptoms include many abortions among ewes, especially during last four to six weeks of pregnancy, and abortion among cattle in middle third of pregnancy

______l. Disease caused by both viruses and bacteria; seen in young or newborn calves, symptoms include diarrhea, rough hair coat, and sunken eyes

______m. Viral infection affecting young pigs; symptoms include marked scouring in all cases and vomiting in some cases

4. Vibriosis
5. Blackleg
6. Scours
7. Pinkeye
8. Erysipelas
9. Swine influenza
10. Transmissible gastroenteritis (TGE)
11. Pneumonia
12. Mastitis
13. Leptospirosis

TEST

______n. Viral infection usually seen on cattle but may affect other animals; symptoms include growths that may appear anywhere on the body and range in size from very small to very large

______o. Also known as *infectious bovine rhinotracheitis* or IBR; viral disease affecting cattle; symptoms generally include going off feed, weight loss, and coughing; animal may also slobber, show pain in swallowing, and produce a nasal discharge

______p. Bacterial infection usually affecting young pigs under 60 to 80 pounds; symptoms include persistent sneezing and snout that begins to wrinkle, bulge, and thicken when pig is from four to eight weeks old

14. Warts
15. Antrophic rhinitis
16. Red nose

8. Match common noninfectious diseases to their correct descriptions. Write the correct numbers in the blanks.

______a. Nutritional disease affecting sheep and occasionally goats, but usually occurring after calving in high-producing cows; caused by low blood calcium concentration; symptoms include loss of appetite, constipation, and general depression followed by nervousness and finally collapse

______b. Nutritional disease of cattle that have grazed on frost- or drought-damaged Johnson grass or Sudan grass; symptoms include staggered walking with animals going down quickly

______c. Nutritional disease affecting all ruminants; caused when animal is fed high-concentrate, low-roughage rations, producing trapped fermented gas

______d. Malignancy originating in mucous membranes of cattle; commonly found in regions of intense sunlight

______e. Nutritional disease of horses, cattle, sheep, and goats; usually caused by overeating (grain, lush legumes, or grass) or overdrinking; first symptoms include extreme pain, fever, and reluctance to move; later symptoms include dropping of hoof soles and turning up of toe walls

1. Bloat
2. Milk fever
3. Cancer eye
4. Founder
5. Prussic acid poisoning

TEST

9. List types of animal health products.

   a. ______________________________

   b. ______________________________

   c. ______________________________

   d. ______________________________

   e. ______________________________

10. List label requirements for animal health products.

    a. ______________________________

    b. ______________________________

    c. ______________________________

    d. ______________________________

    e. ______________________________

    f. ______________________________

    g. ______________________________

    h. ______________________________

11. Discuss guidelines for using animal health products.

    ____

    ____

    ____

    ____

    ____

12. List factors to consider when calculating mixes or determining dosage levels for animal health products.

    a. ______________________________

    b. ______________________________

    c. ______________________________

    d. ______________________________

TEST

(NOTE: Test items 13 through 17 list the assignment and job sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

13. Determine prevention and controls for common parasites.

14. Determine treatment and controls for common diseases.

15. Interpret information on labels of animal health products.

16. Calculate mixes and dosage levels for animal health products.

17. Demonstrate the ability to

    a. Use a drench gun.

    b. Administer worm paste.

    c. Administer a bolus.

    d. Install insecticide ear tag.

CONTROL LIVESTOCK DISEASES AND PARASITES
UNIT III

ANSWERS TO TEST

1. a. 4
   b. 2
   c. 5
   d. 3
   e. 1

2. a. Adult parasite (worm) develops in host animal's body
   b. Parasite's eggs pass from host animal's body in feces
   c. Parasite's eggs are eaten by host animal

3. a. 6
   b. 3
   c. 1
   d. 4
   e. 2
   f. 5
   g. 7

4. a. Larva goes through metamorphosis and becomes an adult
   b. Egg is laid by adult
   c Larva hatches from egg

5. a. 2
   b. 4
   c. 6
   d. 7
   e. 5
   f. 3
   g. 1

6. a. 10
   b. 1
   c. 11
   d. 8
   e. 4
   f. 5
   g. 7
   h. 6
   i. 2
   j. 9
   k. 3

7. a. 2
   b. 3
   c. 1
   d. 8
   e. 12
   f. 13
   g. 5
   h. 11
   i. 9
   j. 7
   k. 4
   l. 6
   m. 10
   n. 14
   o. 16
   p. 15

ANSWERS TO TEST

8. a. 2
   b. 5
   c. 1
   d. 3
   e. 4

9. a. Pharmaceuticals
   b. Biologicals
   c. Parasiticides/insecticides
   d. Vitamins and minerals
   e. Hormones

10. a. Name and address of manufacturer
    b. Statement of net contents
    c. Statement of active and inert ingredients present
    d. Full and complete directions for use
    e. Registration number
    f. Antidote statement when applicable
    g. Precautionary information adequate for safe use
    h. Tables or information for calculating mixes or determining dosage level

11. Discussion should include the following

    a. Buy only from reputable manufacturer and distributor
    b. Reject any product that may have lost its effectiveness
    c. Carefully read complete instructions for product use and follow them faithfully
    d. Carefully read precautionary information and follow it faithfully
    e. Carefully read all information for calculating mixes and determining dosage levels and follow it faithfully

12. a. Method of applying product
    b. Unit of measure to be used for size of animal being treated
    c. Species of animal being treated
    d. Age, sex, and state of animal being treated

13. Evaluated to the satisfaction of the instructor

14. Evaluated to the satisfaction of the instructor

15. Evaluated to the satisfaction of the instructor

ANSWERS TO TEST

16. Evaluated to the satisfaction of the instructor

17. Performance skills evaluated to the satisfaction of the instructor

USE POWER TOOLS
UNIT I

UNIT OBJECTIVE

After completing this unit, the student should be able to state the uses of the six power tools commonly used in agricultural mechanics and identify the parts of each tool. The student should also be able to demonstrate safe and proper use of various power tools. The student will show this ability by completing the assignment sheet, job sheets, and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with power tools.
2. State general safety rules pertaining to power tools.
3. State general guidelines for proper care of power tools.
4. State uses of an abrasive cutoff saw.
5. Identify the parts of an abrasive cutoff saw.
6. State rules for safe use of an abrasive cutoff saw.
7. Distinguish between proper and improper vise holding-positions for metal stock in an abrasive cutoff saw.
8. State uses of a bench grinder.
9. Identify the parts of a bench grinder.
10. State rules for safe use of a bench grinder.
11. State uses of a portable angle grinder.
12. Identify parts of a portable angle grinder.
13. State rules for safe use of a portable angle grinder.
14. Distinguish between uses of the cup grinding wheel and the wire-cup brush accessories for a portable grinder.
15. State uses of a portable circular saw.
16. Identify parts of a portable circular saw.

OBJECTIVE SHEET

17. State rules for safe use of a portable circular saw.

18. State the use of the rip-guide accessory of a portable circular saw.

19. State uses of a drill press.

20. Identify the parts of a drill press.

21. State rules for safe use of a drill press.

22. State uses of a portable drill.

23. Identify the parts of a portable drill.

24. State rules for safe use of a portable drill.

25. Match accessories for drill presses and portable drills to their correct uses.

26. Complete a safety test on general safety rules for power tools and for each of the six power tools commonly used in agricultural mechanics.

27. Demonstrate the ability to

    a. Use an abrasive cutoff saw.

    b. Use a bench grinder.

    c. Use a portable angle grinder.

    d. Use a portable circular saw.

    e. Use a drill press and a portable drill.

USE POWER TOOLS
UNIT I

SUGGESTED ACTIVITIES

I. Unit contents

  A. Objective sheet

  B. Suggested activities

    1. Supplement #1 — Directions for Building an Extension-Cord Holder

    2. Transparency masters

      a. TM #1 — Abrasive Cutoff Saw

      b. TM #2 — Overlay of the Parts of an Abrasive Cutoff Saw

      c. TM #3 — Bench Grinder

      d. TM #4 — Overlay of the Parts of a Bench Grinder

      e. TM #5 — Portable Angle Grinder

      f. TM #6 — Overlay of the Parts of a Portable Angle Grinder

      g. TM #7 — Portable Circular Saw

      h. TM #8 — Overlay of the Parts of a Portable Circular Saw

      i. TM #9 — Drill Press

      j. TM #10 — Overlay of the Parts of a Drill Press

      k. TM #11 — Portable Drill

      l. TM #12 — Overlay of the Parts of a Portable Drill

  C. Information sheet

  D. Assignment Sheet #1 — Complete a Safety Test on General Safety Rules for Power Tools and for Each of the Six Power Tools Commonly Used in Agricultural Mechanics

  E. Job sheets

    1. Job Sheet #1 — Use an Abrasive Cutoff Saw

    2. Job Sheet #2 — Use a Bench Grinder

SUGGESTED ACTIVITIES

3. Job Sheet #3 — Use a Portable Angle Grinder

4. Job Sheet #4 — Use a Portable Circular Saw

5. Job Sheet #5 — Use a Drill Press and a Portable Drill

F. Test

G. Answers to test

II. Instructor's guide

A. Review unit and plan presentation.

(NOTE: This unit has been designed to allow you a great deal of flexibility in presenting the material on the six power tools commonly used in agricultural mechanics. In the information sheet, the safety rules and uses for each tool are grouped together by tool. The safety-test assignment sheet and the unit test can be given in parts to cover just the tool or tools that you are interested in teaching or evaluating at one time. The job sheets are built around operations, thus giving you a choice of teaching techniques. For example, Job Sheet #1 tells how to use an abrasive cutoff saw, and Job Sheet #2 describes the correct procedures for operating a bench grinder. In this way, you can teach either the procedure for the tool, or you can use a combination of presentations. You will want to consider your students, your program, the time available, your shop facilities, your building projects, and other factors in making these decisions.)

B. Obtain materials to supplement unit.

1. Films

a. *Safety in the Shop: Power Tools.* Black and white, 13 1/2 minutes, 1970. Available from Coronet Films, Inc., 65 E. Southwater Street, Chicago, Illinois 60601.

b. *On Every Hand.* Color, 10 minutes, 1970. Available from Journal Films, Inc., 930 Pitner Avenue, Evanston, Illinois 60602.

(NOTE: The above films are available to Oklahoma teachers on a free-loan basis. Oklahoma teachers may order from the Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074. Out-of-state teachers must order from the addresses listed with the films.)

2. Maintenance charts for each power tool (available through power-tool suppliers)

3. Accident report forms

SUGGESTED ACTIVITIES

4. Poster of safety rules for each stationary tool

5. Equipment and materials for job-sheet tasks

    a. Sharp drill bits

    b. Adequate supply of discs, wheels, and blades for the respective saws and grinders

    c. Assortment of accessories for the six power tools addressed in this unit

    d. Adequate supply of safety glasses and face shields in good condition

6. Competency profiles

    (NOTE: Competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Introduce the unit, emphasizing the convenience of power tools while stressing the fact that the use of power tools places on the student an even greater responsibility to be careful.

SUGGESTIONS:

- Tour the shop area, pointing out tools that the student will be studying and demonstrating uses of those tools.
- Stage a contest pitting yourself against a group of students or against a volunteer challenger to see who can cut off a 2×4 faster; provide the student or students with handsaws; after they have started sawing, use a power saw to quickly cut your 2×4; reinforce the demonstration by pointing out that your chances of sustaining a serious injury were much greater than theirs and that if you had been injured, you probably would not have finished first.

D. Provide students with objective sheet, information sheet, and job sheets.

E. Discuss unit and specific objectives, emphasizing the methods you will use to cover the unit.

F. Discuss information and job sheets.

1. Use Information Sheet, Section I to discuss terms associated with power tools.

    SUGGESTIONS:

    - Emphasize to students that these terms will be encountered throughout the unit and are important for communication during the study of the unit.

SUGGESTED ACTIVITIES

- Show the class samples of burrs on metal and stress that burrs are a common source of cuts to the hands when working in the shop.

- Show the class an example of a chuck key and an abrasive disc.

2. Use Information Sheet, Section II to discuss general safety rules pertaining to power tools.

CAUTION

Although ear protection is not discussed in this unit, it is suggested that you discuss it with your class. Explain that in shops where power tools are operating, the noise level can be very high. Point out to students that wearing ear protection devices can help guard against hearing loss.

SUGGESTIONS:

- Show safety films.

- Post at tool station safety rules for each stationary tool.

- Make a display of accident report forms and safety posters.

- Have a person who has been seriously injured by power tools talk to the class about his or her accident.

3. Use Information Sheet, Section III to discuss general guidelines for proper care of power tools.

SUGGESTIONS:

- Demonstrate the proper care of tools in general.

- Display examples of tools that have been improperly cared for or abused.

- Emphasize the importance of properly caring for power tools because of the expense of power tools.

- Discuss maintenance charts for each power tool.

4. Use the remaining sections of the information sheet to discuss the proper uses, parts, and rules for safe use of each tool in accordance with your plan of presentation; use job sheets as required.

SUGGESTED ACTIVITIES

SUGGESTIONS:

- Present the material for a particular tool and require the student to answer correctly all the questions in Assignment Sheet #1 regarding that tool before allowing the student to use that particular tool.
- Point out that by working through the job sheets, students will have most of the components to build an extension-cord holder. See Supplement #1. At a later time you may want to obtain the other components and allow students to complete the extension-cord holder.

G. Review information sheet.

SUGGESTION:

- Have each student demonstrate correct operation of power tools; have other students critique the performances.

H. Give test.

I. Critique test and discuss in class.

J. Reteach and retest as necessary.

K. Complete appropriate section of competency profiles.

III. Unit references

A. *Black & Decker Accessories and Accessory Merchandisers Catalog 325.* Towson, Maryland: Black & Decker (U.S.), Inc., 1979-1980.

B. Feirer, John L. *Woodworking for Industry Technology and Practice*, 3rd ed. Peoria, Illinois: Charles A. Bennett Co., Inc., 1979.

C. Hammond, James J., et al. *Woodworking Technology.* Bloomington, Illinois: McKnight Publishing Company, 1980.

D. Hendrix, Laborn J. "Bud". *Construction Craftsman's Curriculum.* Stillwater, Oklahoma: State Department of Vocational and Technical Education, 1978.

E. Hoerner, Thomas A., and Mervin Bettis. *Power Tool Safety and Operation.* St. Paul, Minnesota: Hobar Publications, 1973.

F. McCarthy, Willard J., and Victor E. Repp. *Machine Tool Technology.* Bloomington, Illinois: McKnight Publishing Company, 1979.

SUGGESTED ACTIVITIES

G. *Milwaukee Tool Catalog 479*. Brookfield, Wisconsin: Milwaukee Electric Tool Corporation, a Subsidiary of Amstar, Corporation, n.d.

H. *Rockwell Professional Power Tools Catalog AD-3700 4/80 10Y (68)*. Pittsburgh, Pennsylvania: Power Tool Division, Rockwell International, 1980.

I. Shinn, Glen C., and Curtis R. Weston. *Working in Agricultural Mechanics*. New York: Gregg Division, McGraw-Hill Book Company, 1978.

J. Wagner, Willis H. *Modern Woodworking*. Homewood, Illinois: Goodheart-Willcox, Inc., 1967.

SUGGESTED ACTIVITIES

SUPPLEMENT #1 — DIRECTIONS FOR BUILDING AN EXTENSION-CORD HOLDER

I. Materials, other than those mentioned in job sheets, that are needed to complete extension-cord holder

A. Brake drum or discarded farm implement disc

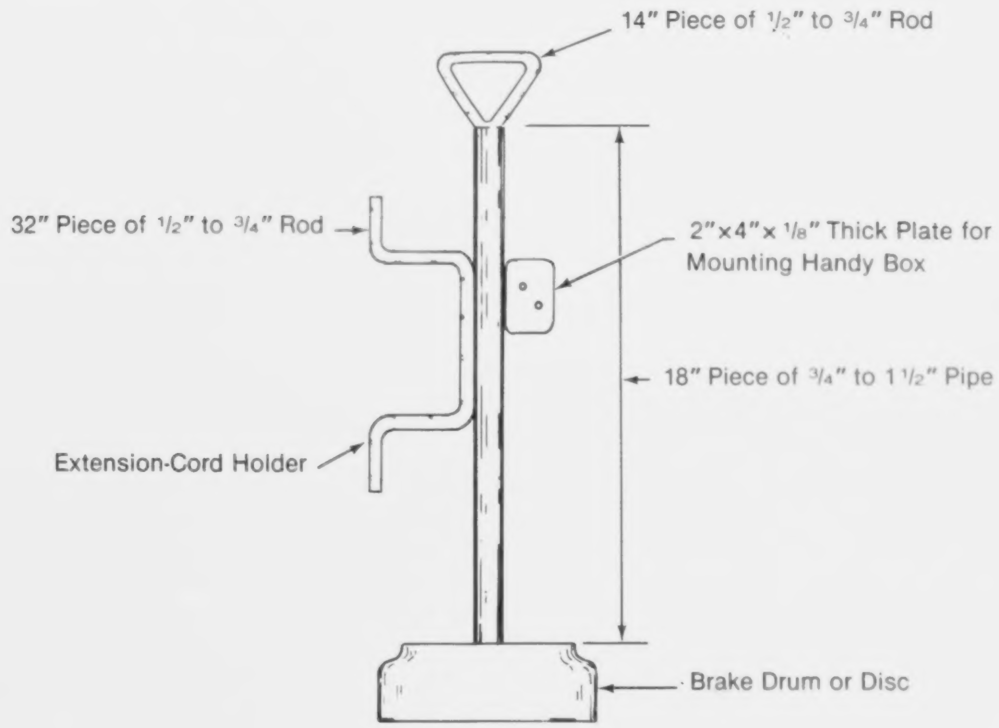
B. Three-pronged duplex receptacle to mount in handy box

C. Handy-box cord clamp to mount in bottom of handy box where cord will come out of handy box

D. Three-way cord for a grounded electrical circuit

(NOTE: Make sure that the cord is long enough for your purposes and that the conductor size is related to the expected amperage-carrying capacity.)

E. Three-pronged male end for cord to plug into a grounded circuit

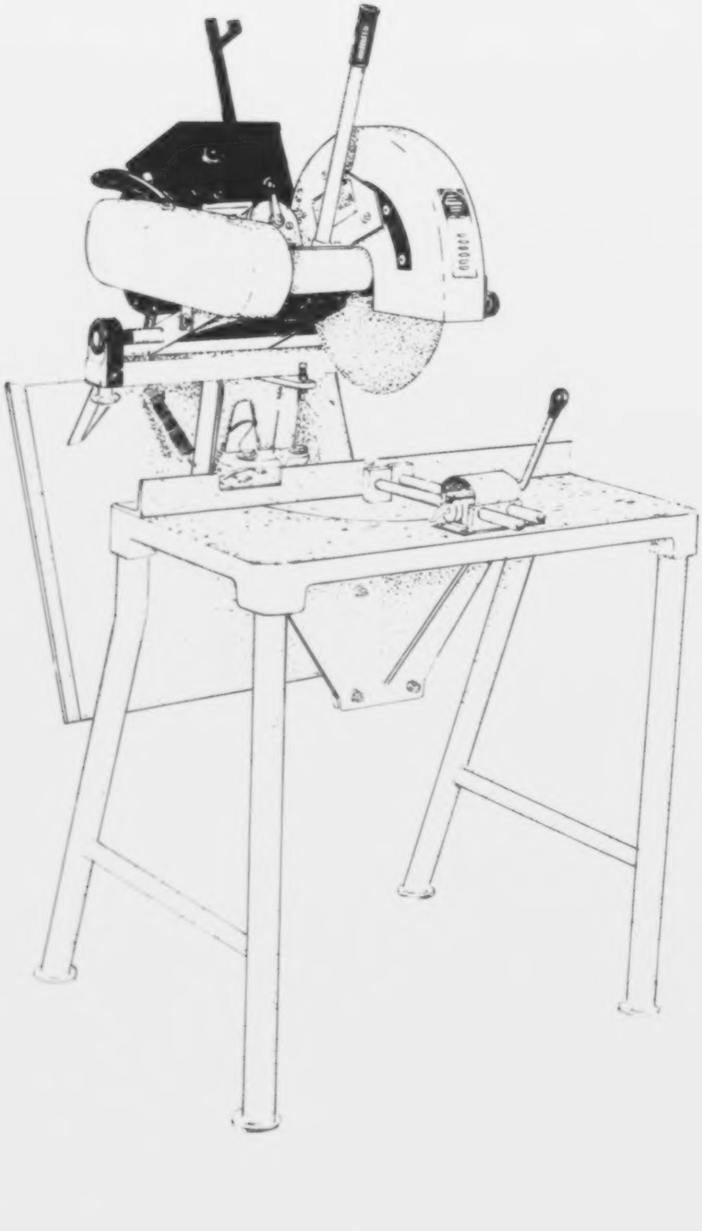

14" Piece of 1/2" to 3/4" Rod
32" Piece of 1/2" to 3/4" Rod
2"×4"× 1/8" Thick Plate for Mounting Handy Box
18" Piece of 3/4" to 1 1/2" Pipe
Extension-Cord Holder
Brake Drum or Disc

SUPPLEMENT #1

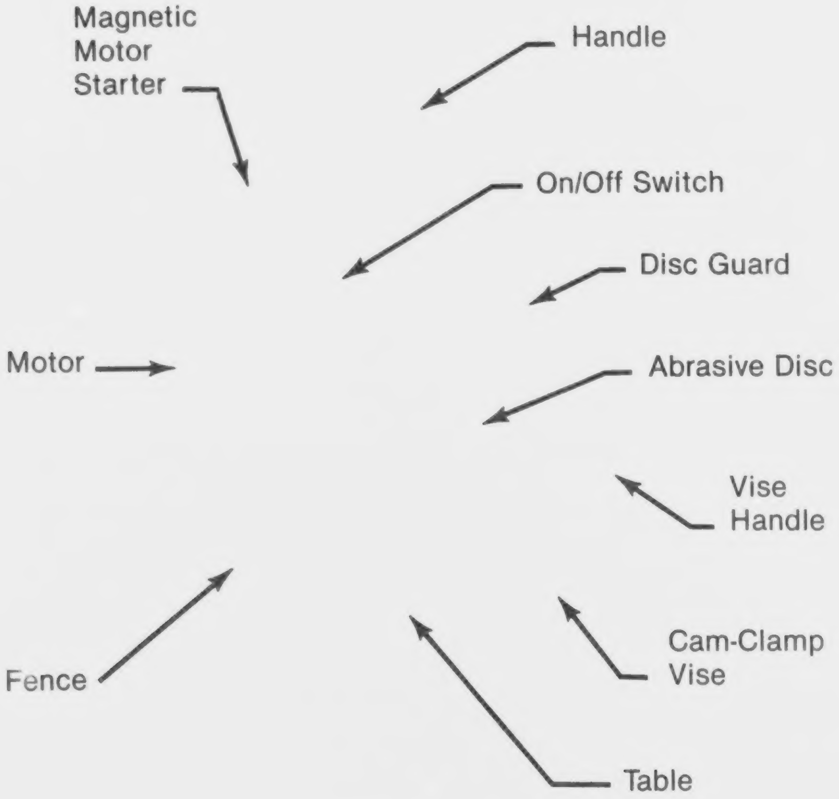
II. Directions for completing extension-cord holder

- A. Weld 18-inch pipe to brake drum or disc
- B. Heat and bend pieces of ½" to ¾" rod as indicated in drawing
- C. Weld rods to pipe as shown in drawing
- D. Weld 2"×4" plate to pipe
- E. Bolt handy box to plate through holes drilled
- F. Install and clamp one end of cord through bottom of handy box
- G. Strip and attach cord conductors to duplex receptacle
- H. Mount duplex receptacle in handy box
- I. Strip and attach conductors on other end of cord to three-pronged male end
- J. Wrap cord on the 32-inch piece of rod that is welded to the 18-inch piece of pipe

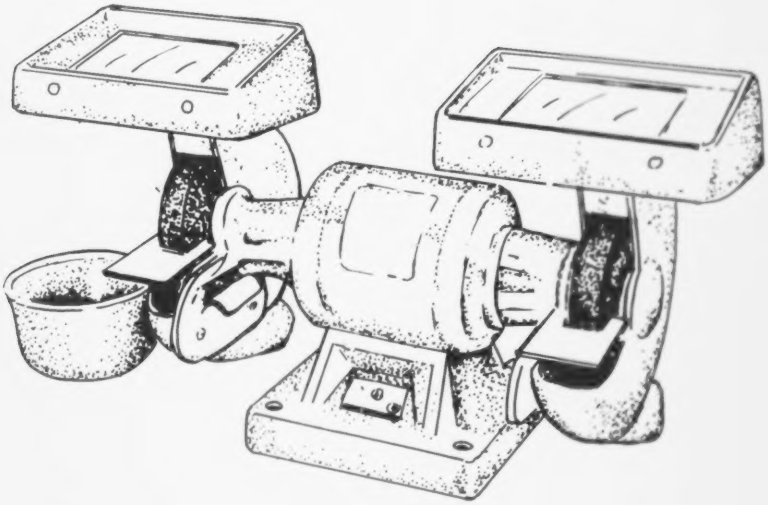
Abrasive Cutoff Saw



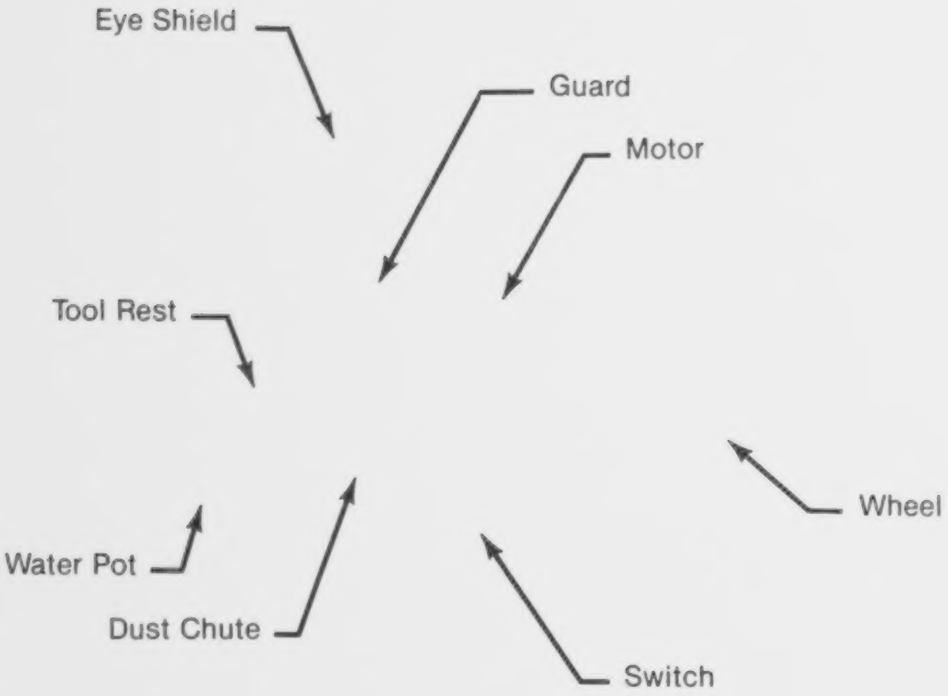
Overlay of the Parts of an Abrasive Cutoff Saw


Magnetic Motor Starter
Handle
On/Off Switch
Disc Guard
Motor
Abrasive Disc
Vise Handle
Fence
Cam-Clamp Vise
Table

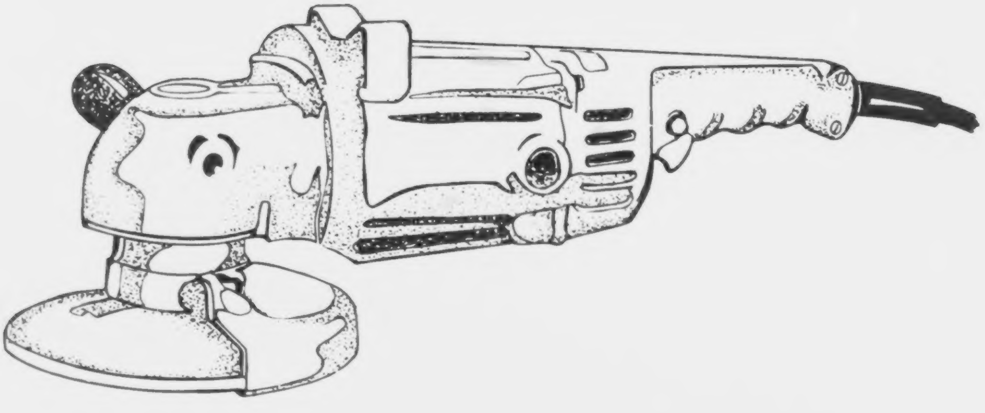
Bench Grinder



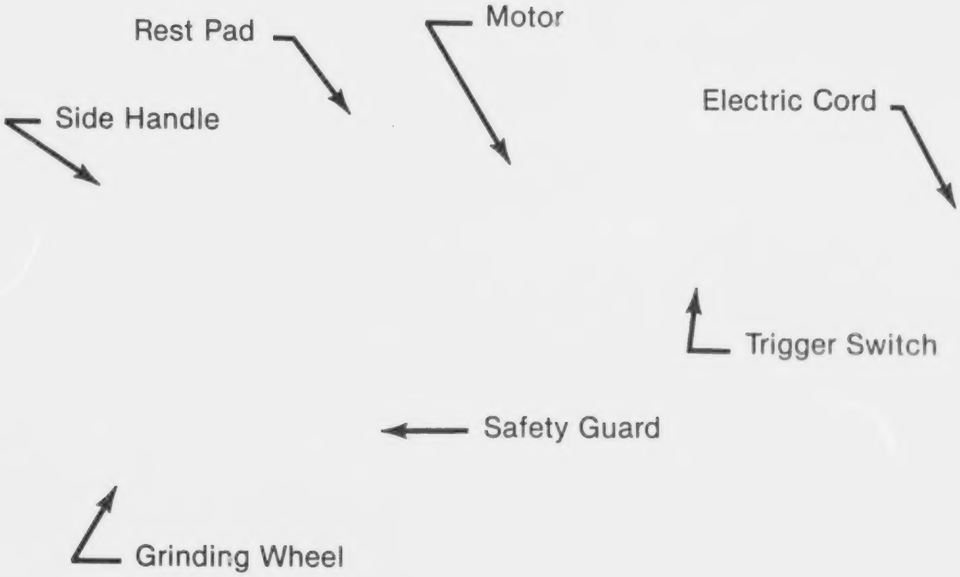
Overlay of the Parts of a Bench Grinder


Eye Shield
Guard
Motor
Tool Rest
Wheel
Water Pot
Dust Chute
Switch

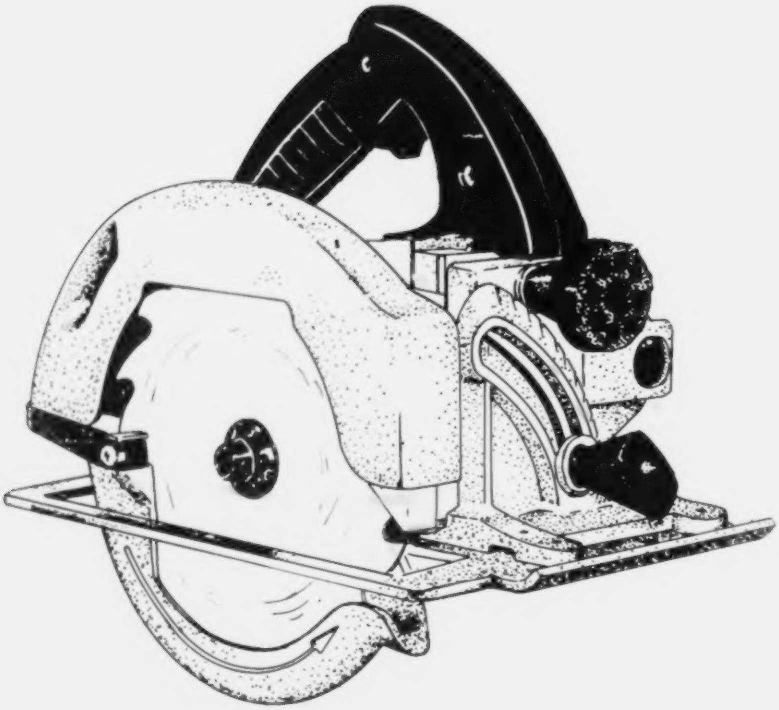
Portable Angle Grinder



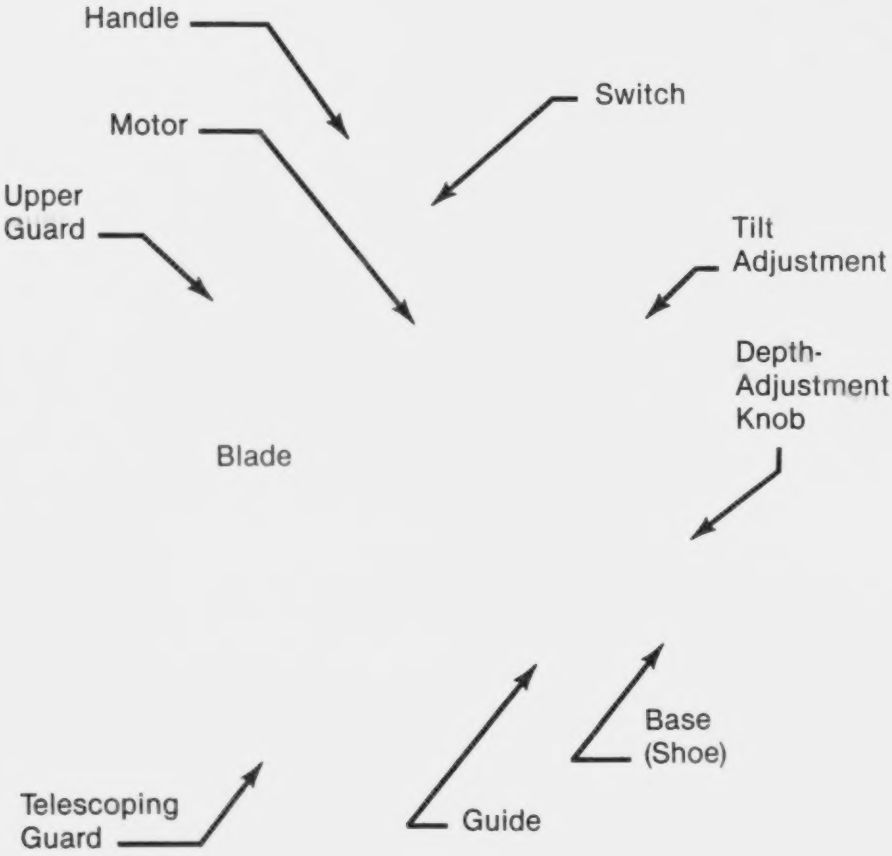
Overlay of the Parts of a Portable Angle Grinder


Rest Pad
Motor
Side Handle
Electric Cord
Trigger Switch
Safety Guard
Grinding Wheel

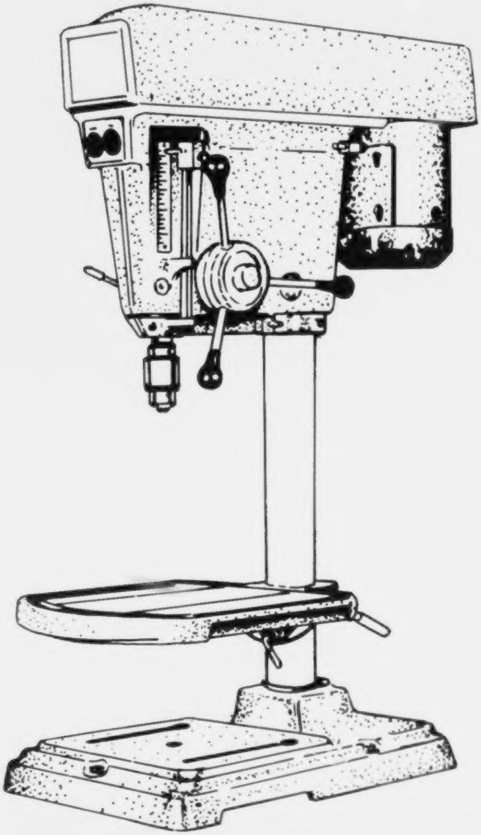
Portable Circular Saw



Overlay of the Parts of a Portable Circular Saw

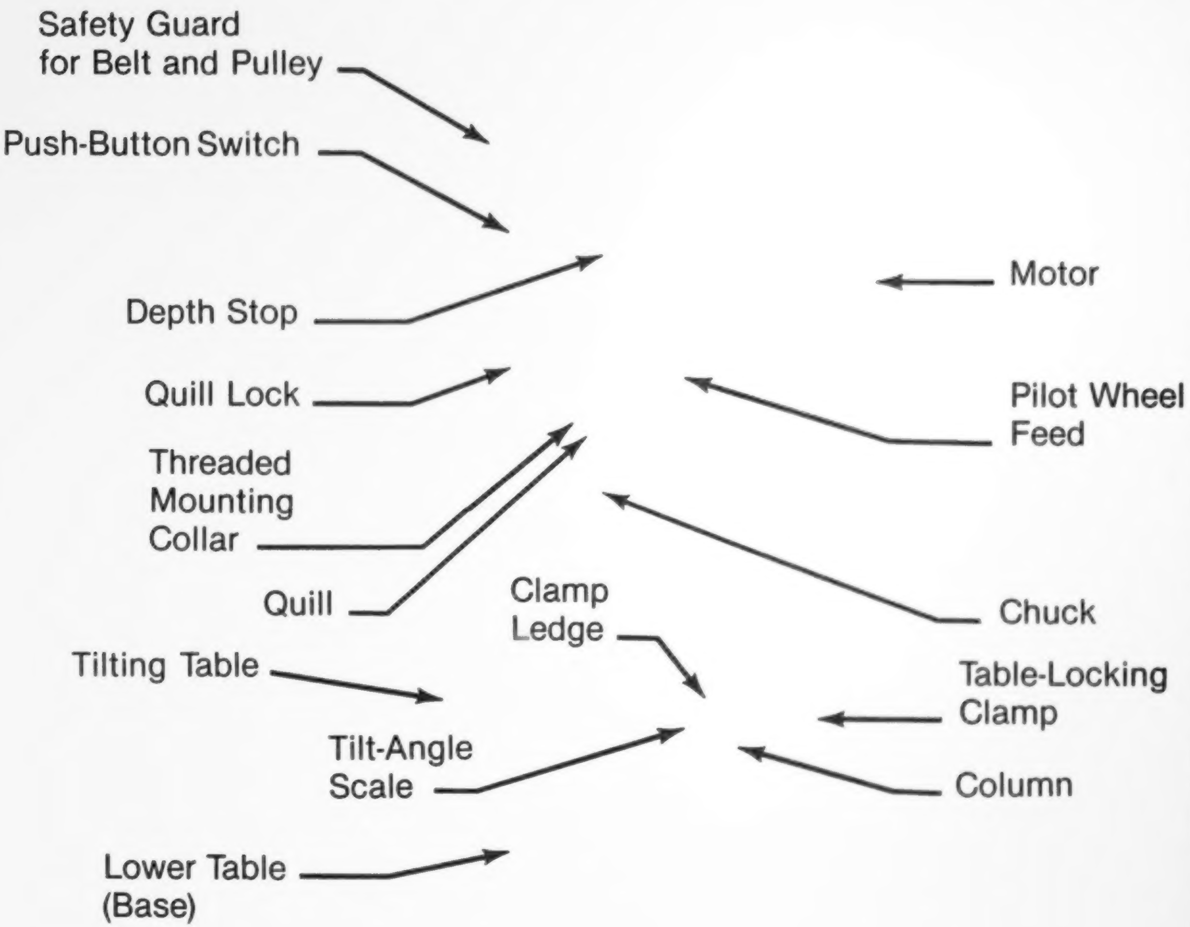

Handle
Switch
Motor
Upper Guard
Tilt Adjustment
Depth-Adjustment Knob
Blade
Base (Shoe)
Telescoping Guard
Guide

Drill Press



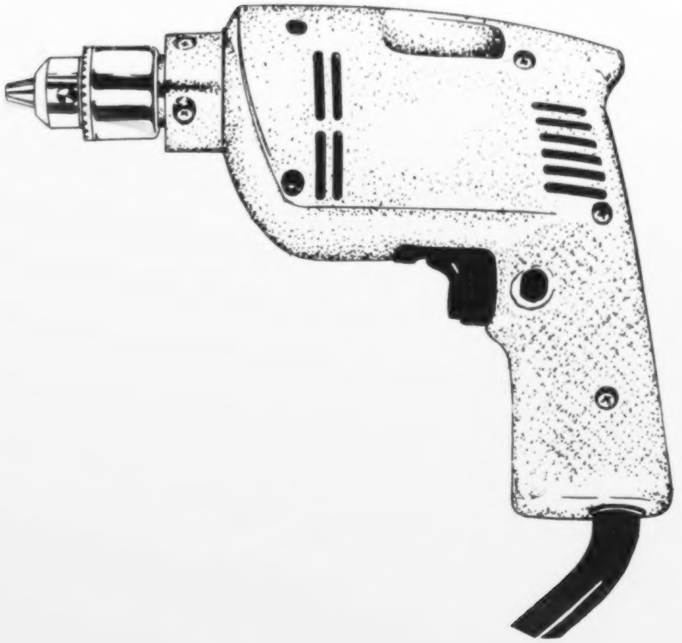
VO AG II - 27-E

Overlay of the Parts of a Drill Press

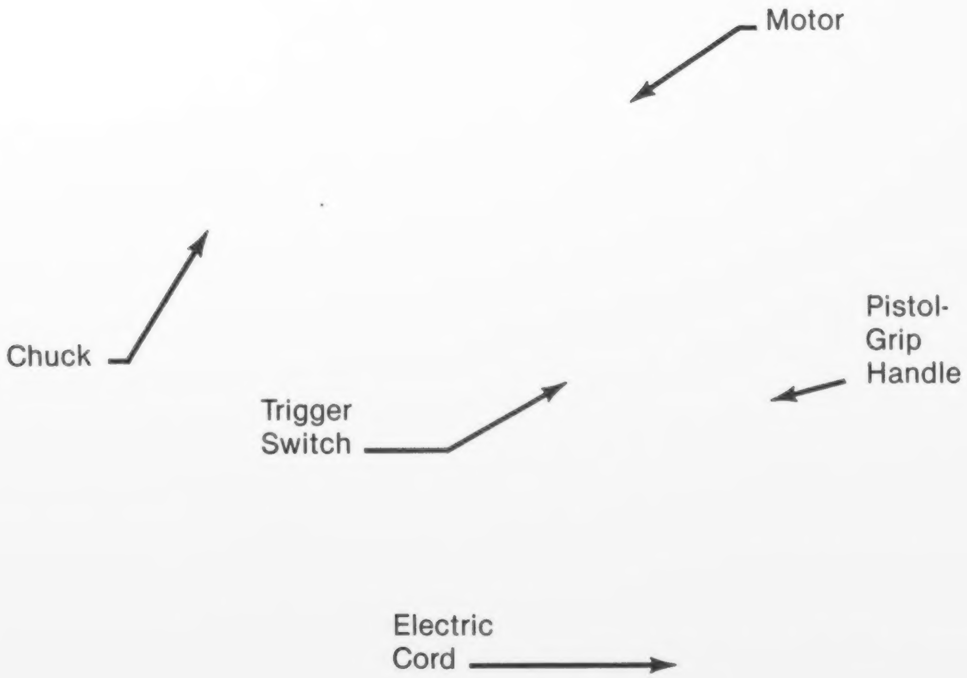

Safety Guard for Belt and Pulley
Push-Button Switch
Motor
Depth Stop
Quill Lock
Pilot Wheel Feed
Threaded Mounting Collar
Quill
Chuck
Clamp Ledge
Tilting Table
Table-Locking Clamp
Tilt-Angle Scale
Column
Lower Table (Base)

TM #10

Portable Drill



Overlay of the Parts of a Portable Drill


Motor
Chuck
Pistol-Grip Handle
Trigger Switch
Electric Cord

USE POWER TOOLS
UNIT I

INFORMATION SHEET

I. Terms and definitions associated with power tools

A. Pneumatic — Powered by compressed air

B. Power tool — Any electrically or pneumatically powered labor-saving device

C. Accessory — Item used with a power tool to increase tool's versatility

D. Material — Item necessary for making something; the whole or the greater part of a finished product

EXAMPLES: Various sheets of metal used in building a stock tank; wood used to build a barn

E. Burr — Thin ridge or area of roughness produced when cutting or shaping metal

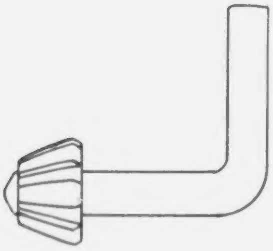
(NOTE: A burr is usually very sharp and is a common source of cuts to the hands when working in the shop.)

F. Chuck key — Specially designed instrument used to tighten drill bits into portable drills and drill presses (Figure 1)

(NOTE: Each drill or drill press has a specific chuck key with a specific number. If a chuck key is lost, you must replace it with a chuck key of the same number as the key that was lost.)

EXAMPLE:

FIGURE 1



INFORMATION SHEET

- G. Abrasive disc — Rough-textured wheel used on power tools to grind or cut metal

II. General safety rules pertaining to power tools

- A. Do not attempt to operate any power tool before being checked out by instructor on that particular tool
- B. Always wear eye protection when operating a power tool
- C. Wear appropriate clothing for job being done

  (NOTE: Always wear snug-fitting clothing that cannot become caught in the moving tool. Roll up long sleeves and tuck in shirttails. Avoid wearing rings or other jewelry.)
- D. Do not distract others or let anyone distract you while operating a power tool
- E. Do not leave power tool running unattended
- F. Assume a safe and comfortable position before using a power tool
- G. Be sure that power tool is properly grounded before using
- H. Be sure that power tool is disconnected before performing maintenance, changing accessories, or making adjustments
- I. Do not use dull or broken tool or accessories
- J. Use a power tool only for its intended use
- K. Keep feet, fingers, and hair away from the blade and other moving parts of a power tool

  (NOTE: Tie back long hair.)
- L. Do not use a power tool with guards or safety devices removed
- M. Do not operate a power tool if hands or feet are wet
- N. Keep work area clean at all times
- O. Read operator's manual and become familiar with the correct operation and adjustments of a power tool before attempting to use it
- P. Keep a firm grip on the power tool at all times
- Q. Use electric extension cords of sufficient size to service particular power tool you are using

INFORMATION SHEET

R. Be sure compressor, air lines, and connections on pneumatic tools are in good repair and without leaks

(NOTE: If a problem appears to exist, notify your instructor.)

S. Immediately report any unusual noises, sounds, or vibrations to the instructor

III. General guidelines for proper care of power tools

A. Keep tools clean and in good working order

B. Keep machine surfaces clean

C. Follow manufacturer's maintenance procedures

D. Protect cutting edges

E. Keep tool accessories, such as blades and bits, sharp

F. Always use appropriate blade for arbor size

G. Inspect tools and accessories regularly

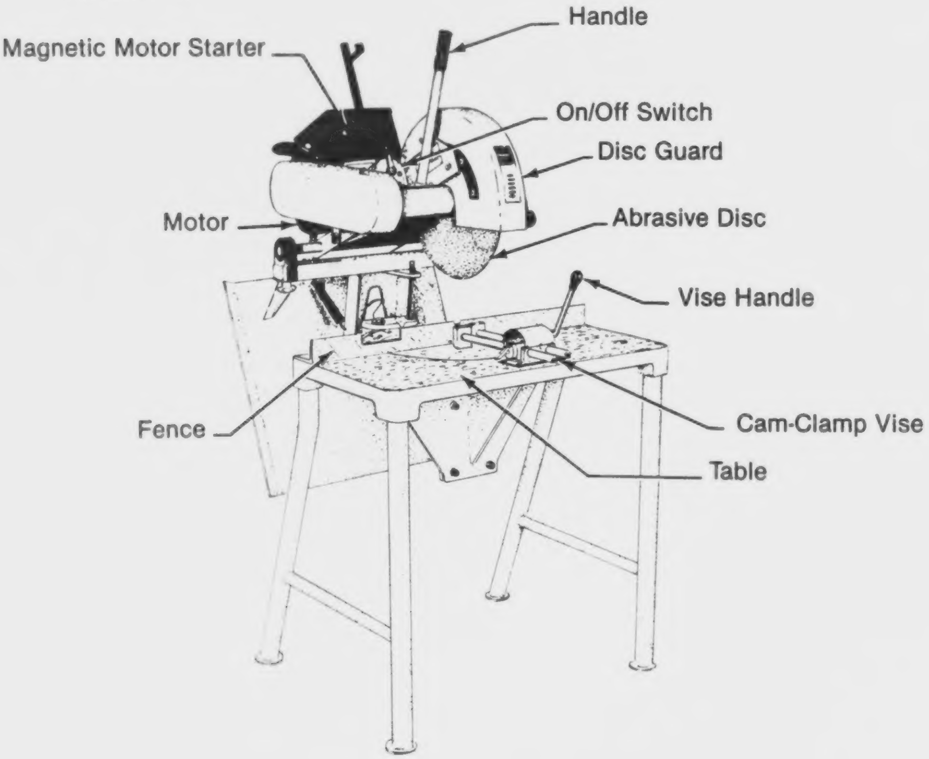
H. Keep tools in their proper place when not in use

IV. Uses of an abrasive cutoff saw — Used to cut bar stock, tubing, and structural steel

INFORMATION SHEET

V. Parts of an abrasive cutoff saw (Figure 2)

FIGURE 2


Handle
Magnetic Motor Starter
On/Off Switch
Disc Guard
Motor
Abrasive Disc
Vise Handle
Fence
Cam-Clamp Vise
Table

VI. Rules for safe use of an abrasive cutoff saw

A. Check abrasive disc and discard disc if it has cracks or missing chunks

B. Clamp materials firmly in cam-clamp vise before cutting

(NOTE: Avoid cutting materials that cannot be clamped in the cam-clamp vise.)

C. Support long material to keep it from falling once cut is complete

D. Allow saw to reach full operating speed before beginning cut

E. Ease blade into material; do not force blade

F. Maintain a continuous, steady pressure while cutting

(NOTE: Do not overload the motor or slow it drastically while cutting.)

G. Always wear face shield and safety glasses when operating abrasive cutoff saw

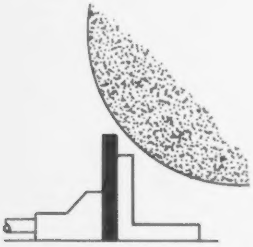
INFORMATION SHEET

VII. Proper vise holding-positions for metal stock in abrasive cutoff saw (Figures 3-10)

(NOTE: The holding positions illustrated provide for the most efficient and safe cutting operations with the least amount of wear on the blade and strain on the saw motor.)

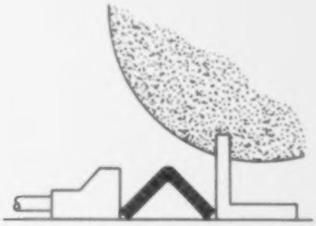
A. Flat strap

FIGURE 3



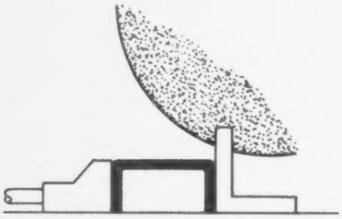
B. Angle iron

FIGURE 4



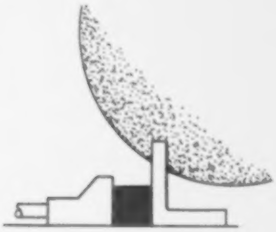
C. Channel iron

FIGURE 5



D. Square stock

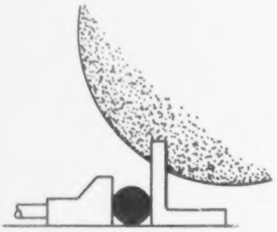
FIGURE 6



Figures 3 through 5 reproduced with the permission of McGraw-Hill/Gregg Division.

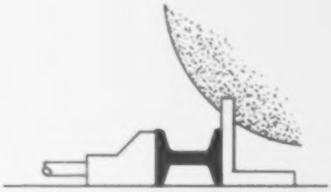
E. Round stock or pipe

FIGURE 7



F. I-beam stock

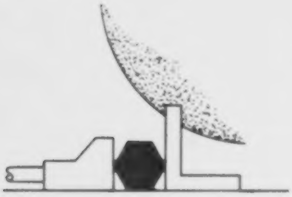
FIGURE 8



INFORMATION SHEET

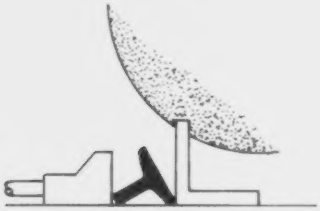
G. Hexagon stock

FIGURE 9



H. Tee stock

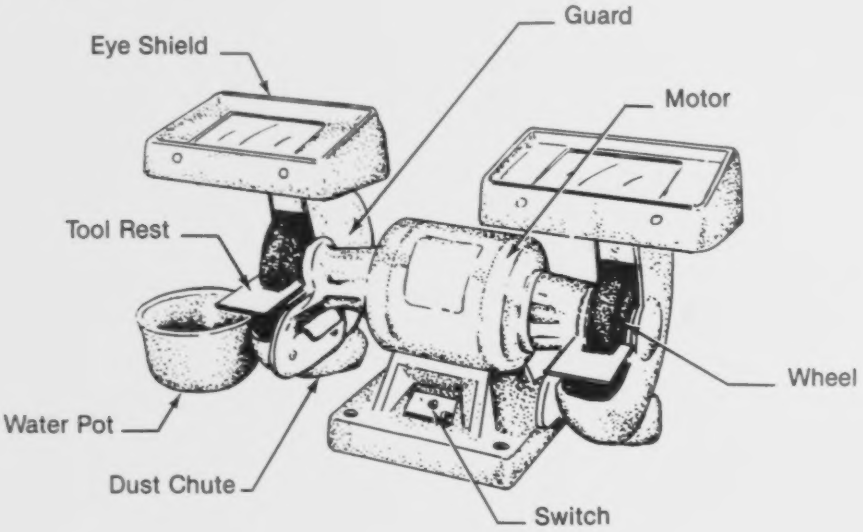
FIGURE 10



VIII. Uses of a bench grinder — Used to sharpen, shape, and recondition hand tools and to grind, deburr, smooth, clean, and shape metal

IX. Parts of a bench grinder (Figure 11)

FIGURE 11


Guard
Eye Shield
Motor
Tool Rest
Wheel
Water Pot
Dust Chute
Switch

X. Rules for safe use of a bench grinder

A. Do not grind woods or plastics

B. Never use grinder with a cracked or damaged wheel

C. Never use a grinder with a wheel that vibrates excessively

INFORMATION SHEET

D. Never wear gloves when using a bench grinder

E. Do not use a grinding wheel that is worn to less than one-half of its original diameter

F. Never use the side of the grinding wheel for grinding

G. Never use grinder to remove paint

H. Do not grind materials that are small enough to allow your fingers to contact the grinding wheel

I. Always use tool rest

J. Adjust tool rest so that it is not more than 1/8 inch from wheel and slightly above center

K. Stand to one side when starting the grinder

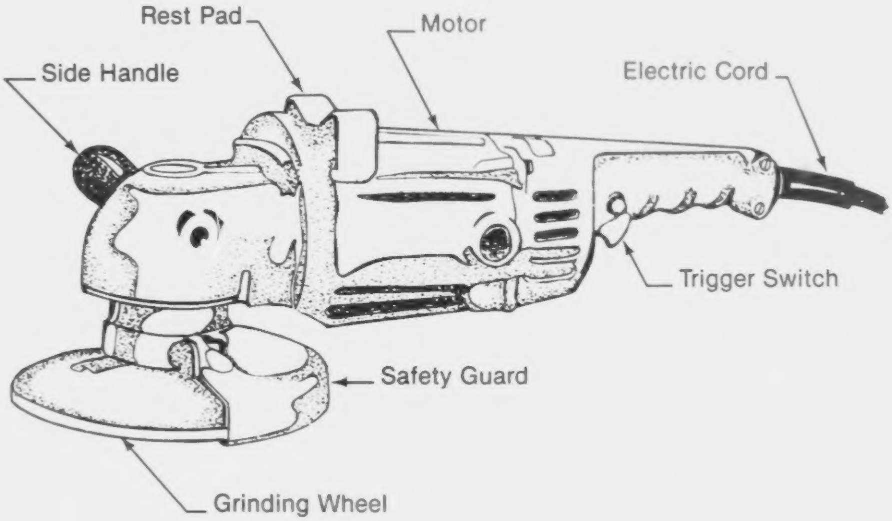
L. Allow grinder to come to full speed before starting to grind

M. Always wear face shield and safety glasses when grinding

XI. Uses of a portable angle grinder — Used to clean, shape, deburr, and smooth rough edges on metal; and to grind and smooth welds

XII. Parts of a portable angle grinder (Figure 12)

FIGURE 12



INFORMATION SHEET

XIII. Rules for safe use of a portable angle grinder

A. Wear gloves when appropriate

B. Use proper grinding wheel for material being ground

EXAMPLE: Wheel for steel, wheel for concrete

C. Do not operate grinder if guards are missing

D. Do not use grinder if wheel vibrates excessively

E. Never use a grinder with cracked or damaged wheel

F. Always wear face shield and safety glasses when grinding

G. Always hold grinder with both hands

H. Make sure work material is held in position firmly before beginning to grind

(NOTE: If the work material is not firmly clamped, welded, or otherwise held in position, it may be slung through the shop and injure a fellow worker.)

I. Bring motor to full speed before beginning to grind

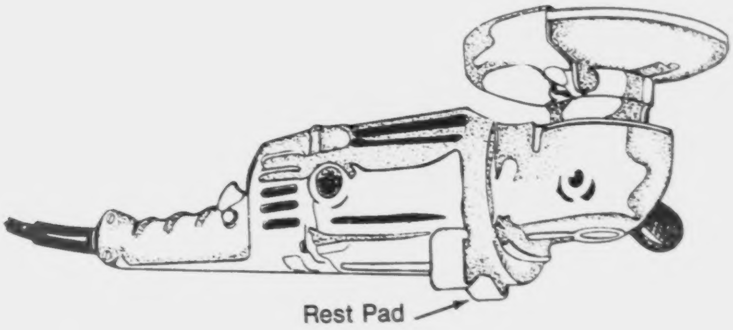
J. Feed grinding wheel lightly into work material

(NOTE: Do not force the wheel into the work material enough to reduce significantly the speed of the motor.)

K. Be sure that wheel has stopped turning before laying grinder down

L. Lay grinder on its rest pad so that nothing touches grinding wheel while grinder is not in use (Figure 13)

FIGURE 13



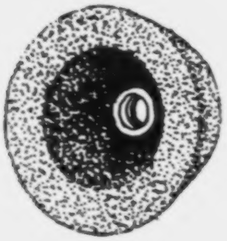
INFORMATION SHEET

XIV. Uses of accessories for a portable angle grinder

A. Cup grinding wheel — Used to grind all types of metal (Figure 14)

EXAMPLE:

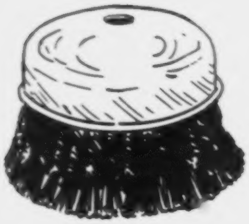
FIGURE 14



B. Wire-cup brush — Used to remove rust, scale, and paint from metal and to clean metal (Figure 15)

EXAMPLE:

FIGURE 15

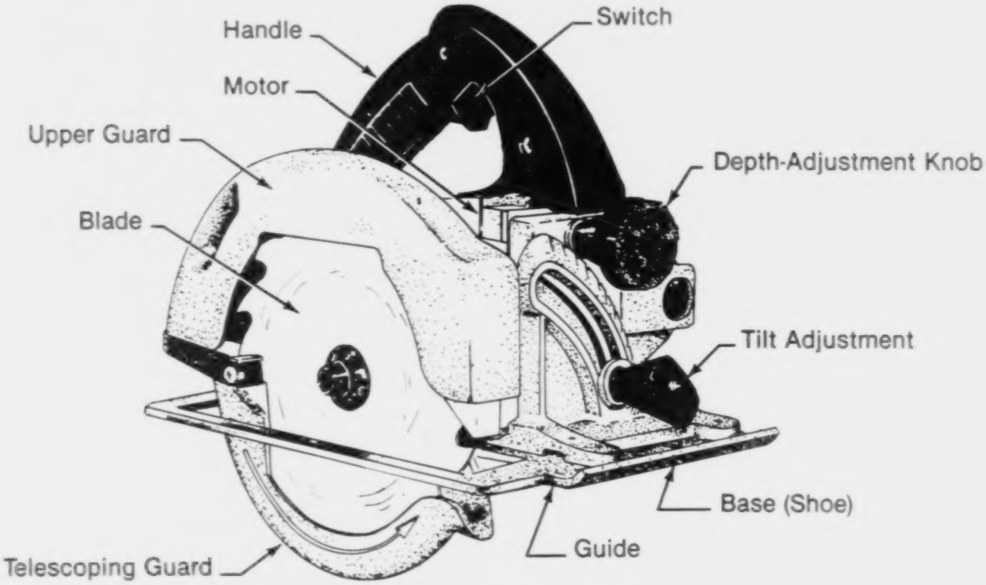


XV. Uses of a portable circular saw — Used to crosscut, rip, miter, and bevel lumber, wood products, wood by-products, and plastic

INFORMATION SHEET

XVI. Parts of a portable circular saw (Figure 16)

FIGURE 16


Handle
Switch
Motor
Upper Guard
Depth-Adjustment Knob
Blade
Tilt Adjustment
Base (Shoe)
Guide
Telescoping Guard

XVII. Rules for safe use of a portable circular saw

A. Make sure telescoping guard is free and retractable

(NOTE: Never lock the telescoping guard in the retracted position.)

B. Check material for nails and any other metal before cutting

C. Use appropriate blade for cut to be made (Table 1)

(NOTE: A wide variety of blades is available for different cutting operations.)

EXAMPLE:

TABLE 1: Appropriate circular-saw blade for cut

Cut	Type of blade
Crosscut	Crosscut or combination
Ripping	Ripping or combination
Bevel	Crosscut or combination
Miter	Crosscut or combination

INFORMATION SHEET

D. Use good, solid support for material being cut

E. Use only sharp blades

F. Make sure all adjustments are tight and are readjusted as necessary

G. Wear safety glasses or other appropriate eye protection when operating saw

H. Do not saw in awkward positons

EXAMPLES: Do not try to saw overhead or while standing on a ladder or on a sloping surface.

I. Adjust depth of cut so that saw-blade teeth clear thickness of material by the depth of the teeth

J. Do not attempt to make curved cuts

K. Allow saw to reach maximum speed before advancing it into material

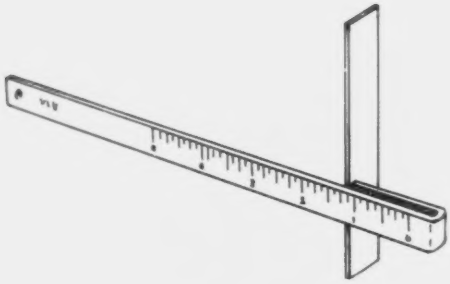
L. Do not release starting trigger if saw stalls; back saw out and determine why saw is binding

(NOTE: Saw may be binding because you are attempting to wedge it or to turn in cut.)

XVIII. Use of the rip-guide accessory of a portable circular saw — Used to help maintain straight cuts during ripping (Figure 17)

EXAMPLE:

FIGURE 17

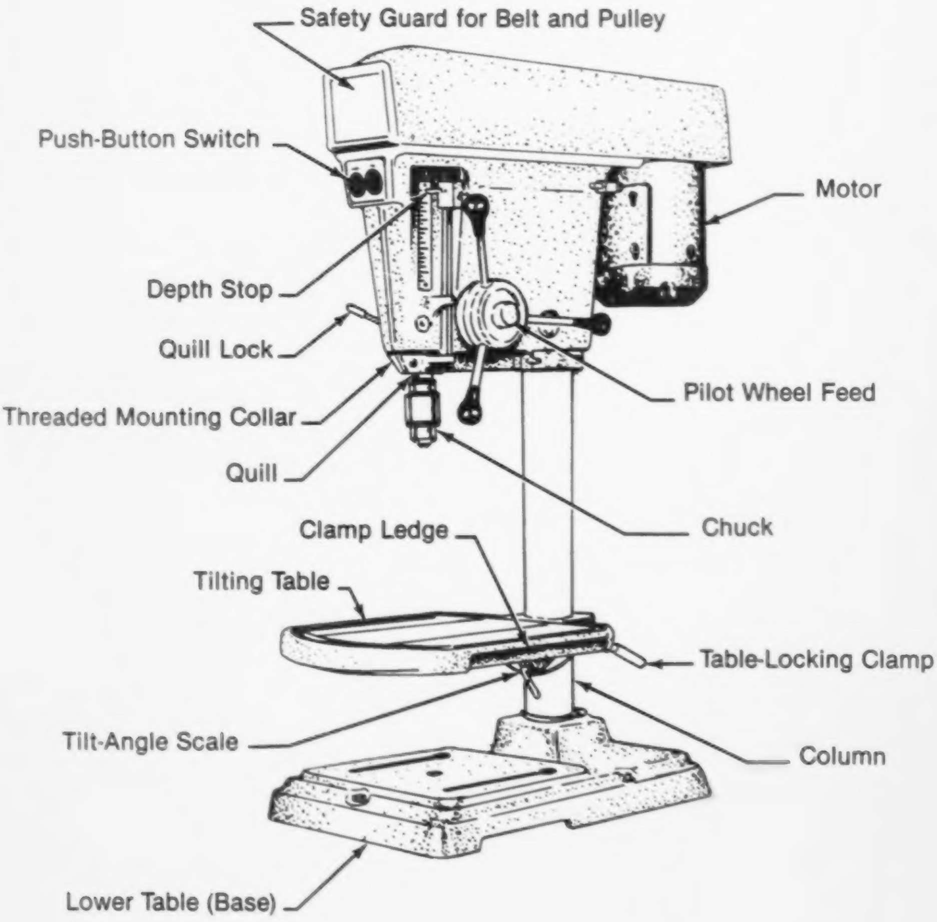


XIX. Uses of a drill press — Used to drill and bore wood and all types of steel

INFORMATION SHEET

XX. Parts of a drill press (Figure 18)

FIGURE 18


Safety Guard for Belt and Pulley
Push-Button Switch
Motor
Depth Stop
Quill Lock
Pilot Wheel Feed
Threaded Mounting Collar
Quill
Chuck
Clamp Ledge
Tilting Table
Table-Locking Clamp
Tilt-Angle Scale
Column
Lower Table (Base)

INFORMATION SHEET

XXI. Rules for safe use of a drill press

A. Check drill bit to be sure it is sharp

B. Never wear gloves while operating drill press

C. Place a block of wood under work material to prevent damage to table or vise (See Figures 19 and 20)

D. Clamp work material securely in proper work-holding device (Figures 19-21)

EXAMPLES:

FIGURE 19: Flat stock held in vise

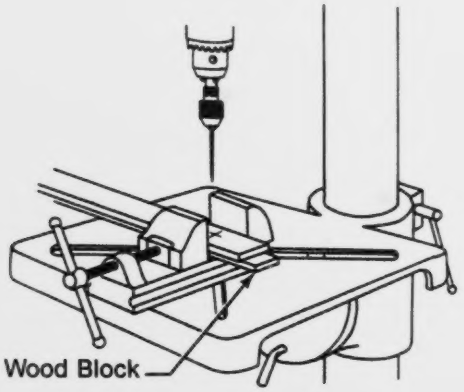


FIGURE 20: Flat stock held with C-clamp

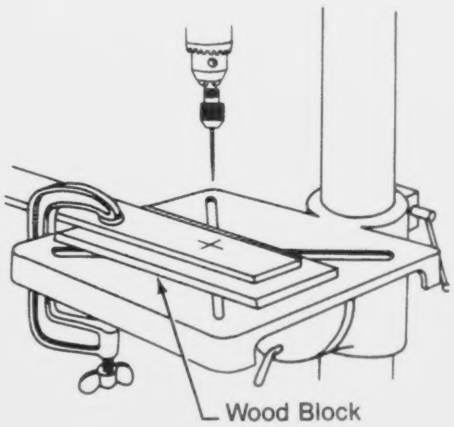
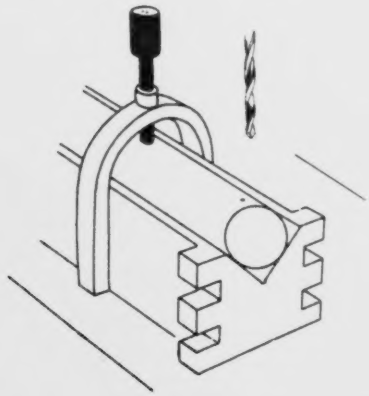


FIGURE 21: Round stock held with V-block



Figures 19 through 21 from MACHINE TOOL TECHNOLOGY by Victor E. Repp and Willard J. McCarthy. Copyright 1984. Used with permission of Bennett and McKnight, a division of Glencoe Publishing Company.

INFORMATION SHEET

E. Support long material

F. Place long end of material to left so it will hit post and not operator should material slip and start rotating

G. Use center punch to mark point where drill tip will be started

H. Drill pilot hole for holes that will be larger than $^3/_8$ inch

I. Wear safety glasses or other appropriate eye protection when drilling

J. Always remove chuck key before turning on power

K. Use correct speed for job being performed

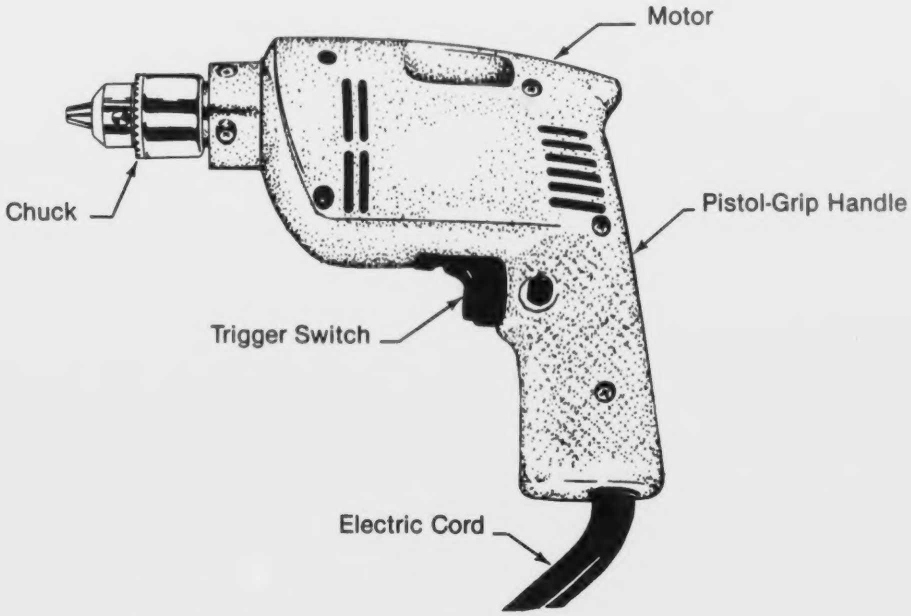
L. Do not force drill into material

M. Use cutting oil when drilling into steel

XXII. Uses of a portable drill — Used to drill and bore wood and all types of steel; to drive screws; and to mix material

XXIII. Parts of a portable drill (Figure 22)

FIGURE 22



INFORMATION SHEET

XXIV. Rules for safe use of a portable drill

A. Select the proper drill size for the job

B. Check drill to be sure it is sharp

C. Use center punch to mark point where drill tip will be started

D. Securely fasten material to table

(NOTE: Securely fastened material will not twist or turn.)

E. Tighten chuck securely on drill

F. Always remove chuck key before turning on power

G. Wear safety glasses or other appropriate eye protection when drilling

H. Use correct speed for job being performed

I. Allow drill motor to come to full speed before beginning drilling process

J. Hold drill at right angle during drilling process

K. Do not force drill into material

L. Maintain even, steady pressure during drilling process

M. Ease off pressure as drill starts to break through material

(NOTE: Easing off pressure will prevent grabbing or splintering.)

N. Never attempt to stop drill by taking hold of chuck

O. On deep cuts, back drill out often to clean out hole

P. Never point drill at anyone

XXV. Uses of accessories for drill presses and portable drills

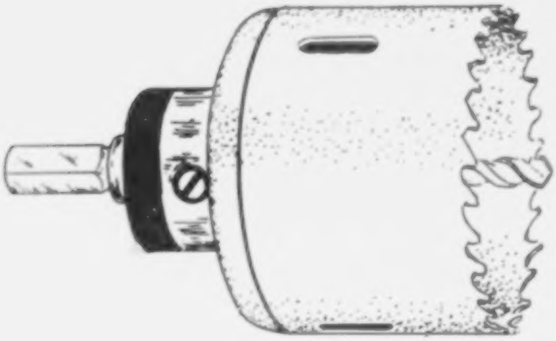
(NOTE: The accessories listed below are the ones most commonly used with drill presses and portable drills. Other less-common accessories include rotary rasps and files, grinding stones, sanding discs, buffing pads, screwdriver bits, and drill pumps.)

A. Hole saw — Used with drill press or portable drill to cut holes in material (See Figure 23)

(NOTE: Some hole saws are designed for cutting wood only; others are designed for multipurpose cutting. Hole saws are available in a wide variety of sizes.)

EXAMPLE:

FIGURE 23

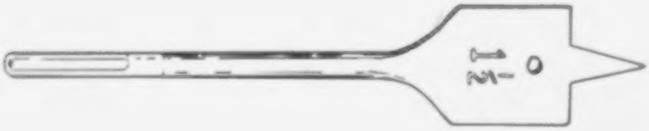


B. Flat boring bit — Used with drill press or portable drill to drill holes in wood or wood products, plastic, or plastic laminate (Figure 24)

(NOTE: Flat boring bits are available in a variety of lengths and diameters. Bits used in electric drill presses or portable electric drills must have a straight shank to fit the standard chuck.)

EXAMPLE:

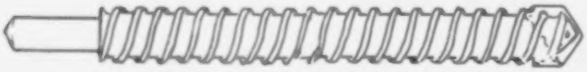
FIGURE 24



C. Masonry bit — Used with drill press or portable drill to drill masonry, brick, stone, plaster, or slate (Figure 25)

EXAMPLE:

FIGURE 25

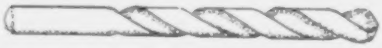


INFORMATION SHEET

D. Twist drill bit — Used with drill press or portable drill to drill all materials except masonry products (Figure 26)

EXAMPLE:

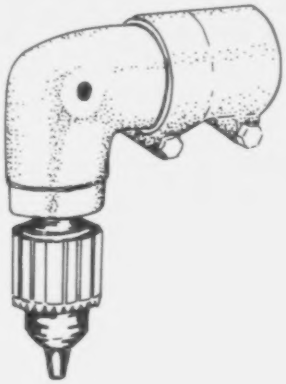
FIGURE 26



E. Right-angle drill attachment — Used with portable drill to allow drilling in tight spots (Figure 27)

EXAMPLE:

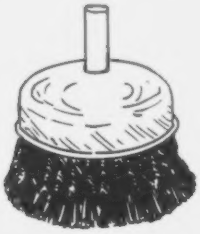
FIGURE 27



F. Wire-cup brush — Used with portable drill to remove paint and rust and to clean metal (Figure 28)

EXAMPLE:

FIGURE 28

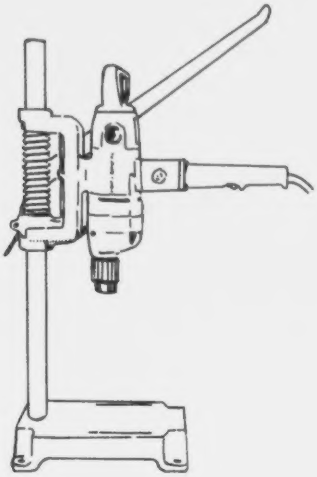


INFORMATION SHEET

G. Portable-drill stand — Used with portable drill to allow it to function as a drill press (Figure 29)

EXAMPLE:

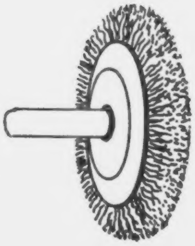
FIGURE 29



H. Wire-wheel brush — Used with portable drill to remove paint and rust and to clean metal (Figure 30)

EXAMPLE:

FIGURE 30



898

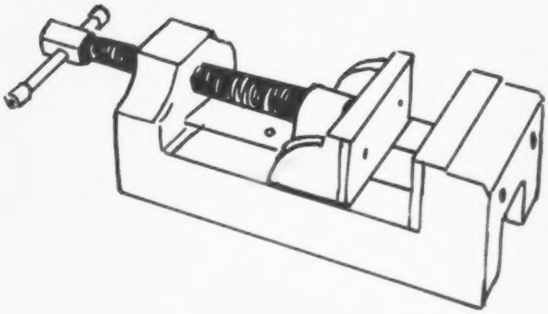
INFORMATION SHEET

I. Drill-press vise — Used with drill press to hold material being drilled (Figure 31)

(NOTE: The vise is fastened to the drill-press table.)

EXAMPLE:

FIGURE 31



USE POWER TOOLS
UNIT I

ASSIGNMENT SHEET #1 — COMPLETE A SAFETY TEST ON GENERAL SAFETY RULES FOR POWER TOOLS AND FOR EACH OF THE SIX POWER TOOLS COMMONLY USED IN AGRICULTURAL MECHANICS

NAME ________________________________ TOTAL SCORE __________

Before you will be allowed to operate the power tools in the agricultural mechanics shop, you must demonstrate to your instructor your knowledge of the safety rules for each of those power tools and of the general rules for safe use and proper care of power tools. Using power tools safely is important to protect you and to make efficient use of your time.

Complete the safety tests. Read each statement, and then circle "T" if the statement is true and "F" if the statement is false. You must complete each of the tests with 100 percent accuracy.

PART A — **Safety Test for General Rules Pertaining to Power Tools**

Score ____________

T F 1. Do not attempt to operate any power tool before being checked out by your instructor on that particular tool

T F 2. Wear eye protection and hard hat when it is convenient while operating a power tool

T F 3. Distract others only when necessary when they are operating a power tool

T F 4. Try to determine whether or not power tool is properly grounded before using it

T F 5. Use dull tool or accessories only when necessary

T F 6. Use a power tool only for its intended use

T F 7. Remove guards when necessary to operate power tool efficiently

T F 8. Read operator's manual and become familiar with the correct operation and adjustments of a power tool before attempting to use it

T F 9. Be sure compressor, air lines, and connections on pneumatic tools are in good repair and are without leaks

T F 10. Report any unusual noises, sounds, or vibrations to the instructor when he or she is available while you are using a power tool

ASSIGNMENT SHEET #1

PART B — **Safety Test for General Guidelines for Proper Care of Power Tools**

Score ____________

T F 1. Clean tools every other time you use them

T F 2. Keep machine surfaces clean

T F 3. Follow manufacturer's maintenance procedures

T F 4. Protect cutting edges

T F 5. Replace dull blades and bits when convenient

T F 6. Use appropriate blade for arbor size

T F 7. Inspect tools and accessories when you think of it

T F 8. Keep tools on the workbench when not in use

T F 9. Inspect tools and accessories regularly

T F 10. Keep tools clean and in good working order

PART C — **Safety Test for an Abrasive Cutoff Saw**

Score ____________

T F 1. Check abrasive disc and use it carefully if it has cracks in it

T F 2. Remove guards when operating saw

T F 3. Clamp materials loosely in cam-clamp vise before cutting

T F 4. Allow long material to fall away from saw once cut is complete

T F 5. Support long material to keep it from falling once cut is complete

T F 6. Allow saw to nearly reach full operating speed before beginning cut

T F 7. Force blade into material

T F 8. Maintain a continuous, steady pressure while cutting

T F 9. Always wear face shield and safety glasses when operating abrasive cutoff saw

T F 10. Make sure motor slows drastically after beginning cut

ASSIGNMENT SHEET #1

PART D — **Safety Test for a Bench Grinder**

Score ____________

T F 1. Grind woods or plastics

T F 2. Never use grinder with a cracked or damaged wheel

T F 3. Use a grinder with a wheel that vibrates excessively

T F 4. Wear gloves when using a bench grinder

T F 5. Do not use a grinding wheel that is worn to less than one-half of its original diameter

T F 6. Use the side of the grinding wheel for grinding

T F 7. Use grinder to remove paint

T F 8. Always remove the tool rest

T F 9. Stand to one side when starting the grinder

T F 10. Allow grinder to come to full speed before starting to grind

PART E — **Safety Test for a Portable Angle Grinder**

Score ____________

T F 1. Wear gloves when appropriate

T F 2. Use proper grinding wheel for material being ground

T F 3. Do not operate grinder if guards are missing

T F 4. Do not use grinder if wheel vibrates excessively

T F 5. Hold grinder securely in one hand

T F 6. Hold work material loosely

T F 7. Bring motor nearly to full speed before beginning to grind

T F 8. Feed grinding wheel lightly into work material

T F 9. Be sure that wheel has nearly stopped turning before laying grinder down

T F 10. Lay grinder on grinding disc while grinder is not in use

ASSIGNMENT SHEET #1

PART F — **Safety Test for a Portable Circular Saw**

Score ____________

T F 1. Make sure automatic guard is locked in retracted position

T F 2. Check material for nails and any other metal while cutting

T F 3. Use appropriate blade for cut to be made

T F 4. Use good, solid support for material being cut

T F 5. Check blades to make sure that they are reasonably sharp

T F 6. Make sure all adjustments are tight and are readjusted as necessary

T F 7. Adjust depth of cut so that saw-blade teeth clear thickness of material by the depth of the material

T F 8. Do not attempt to make curved cuts

T F 9. Allow saw to reach maximum speed before advancing it into material

T F 10. Do not release starting trigger if saw stalls; back saw out and immediately try to start cut again

PART G — **Safety Test for a Drill Press**

Score ____________

T F 1. Wear gloves while operating drill press

T F 2. Place a block of wood under work material to prevent damage to table or vise

T F 3. Clamp work material securely in proper work-holding device

T F 4. Support long material if possible

T F 5. Place long end of material to right so it will hit post should material slip and start rotating

T F 6. Use center punch to mark point where drill tip will be started

T F 7. Drill pilot hole for holes that will be larger than 1/8 inch

T F 8. Remove chuck key after turning on power

T F 9. Use correct speed for job being performed

T F 10. Use cutting oil when drilling into wood

ASSIGNMENT SHEET #1

PART H — **Safety Test for a Portable Drill**

Score ____________

T F 1. Select the proper drill size for the job

T F 2. Use a crayon to mark approximate point where drill tip will be started

T F 3. Securely fasten material to table

T F 4. Be sure that chuck is loose on drill

T F 5. Always remove chuck key before turning on power

T F 6. Allow drill motor to come to full speed before beginning drilling process

T F 7. Hold drill at a 45-degree angle during drilling process

T F 8. Maintain even, steady pressure during drilling process

T F 9. Apply more pressure as drill starts to break through material

T F 10. On deep cuts, back drill out often to clean out hole

USE POWER TOOLS
UNIT I

ANSWERS TO ASSIGNMENT SHEET

Assignment Sheet #1

PART A

1. T
2. F
3. F
4. F
5. F
6. T
7. F
8. T
9. T
10. F

PART B

1. F
2. T
3. T
4. T
5. F
6. T
7. F
8. F
9. T
10. T

PART C

1. F
2. F
3. F
4. F
5. T
6. F
7. F
8. T
9. T
10. F

PART D

1. F
2. T
3. F
4. F
5. T
6. F
7. F
8. F
9. T
10. T

PART E

1. T
2. T
3. T
4. T
5. F
6. F
7. F
8. T
9. F
10. F

PART F

1. F
2. F
3. T
4. T
5. F
6. T
7. F
8. T
9. T
10. F

PART G

1. F
2. T
3. T
4. F
5. F
6. T
7. F
8. F
9. T
10. F

PART H

1. T
2. F
3. T
4. F
5. T
6. T
7. F
8. T
9. F
10. T

USE POWER TOOLS
UNIT I

JOB SHEET #1 — USE AN ABRASIVE CUTOFF SAW

I. Equipment and materials

A. $^{3}/_{4}$-inch to $1^{1}/_{2}$-inch pipe longer than 18 inches

(NOTE: Pipe should have at least one smooth, square-cut end.)

B. $^{1}/_{2}$-inch to $^{3}/_{4}$-inch rod at least 46 inches long

(NOTE: Rod should have at least one smooth, square-cut end.)

C. Safety face shield and safety glasses

D. Gloves

E. Tape measure

F. Soapstone

G. Device to support long material

H. Abrasive cutoff saw and abrasive disc

I. Table or workbench

II. Procedure

(NOTE: The pipe and rod to be cut in this job sheet may be used to construct an extension-cord stand. Save pipe and rod and see your instructor for further directions.)

A. Check abrasive disc for cracks or missing chunks; discard and have instructor replace disc if necessary

B. Check to see that all safety devices are in place

C. Make sure saw angle adjustment is set on "0"

D. Lay pipe on a work surface; support as necessary

E. Measure and mark pipe with soapstone where cut is to be made, 18 inches from square-cut end

F. Adjust cam-clamp vise to an opening greater than diameter of pipe

G. Lay pipe on saw table so that square-cut end contacts fence; support as necessary

JOB SHEET #1

H. Align soapstone mark on pipe with vertical path of abrasive disc

I. Adjust mark to allow for thickness of abrasive disc

J. With vise handle in up position, slide cam-clamp vise blocks in firmly against pipe

K. Tighten T-handle adjustment screws on each side of cam-clamp vise

L. Check disc and mark alignment by pulling saw handle down until abrasive disc lightly touches pipe

M. Move saw handle up slowly to return disc to up position

(NOTE: The handle is spring-loaded and will return to its original position with a bang if it is simply released.)

N. Pull vise handle toward you and down to tighten cam-clamp vise against pipe

O. Put on safety glasses, face shield, and gloves

P. Turn on saw

Q. With saw handle still in up position, turn on saw and allow abrasive disc to reach full operating speed

R. Ease abrasive disc down against pipe by pulling down on saw handle

S. Maintain a continuous, steady pressure on saw handle while cutting

CAUTION

Do not apply excessive pressure that obviously slows the saw speed. Listen to motor to detect sound of motor slowing or watch overload light if saw is so equipped.

T. After disc has cut completely through pipe, move saw handle up slowly to return disc to up position

U. Turn saw off

V. Repeat steps A through U to cut 14-inch and 32-inch pieces of rod

W. Remove face shield and safety glasses

X. Return excess pipe to proper storage

JOB SHEET #1

CAUTION

Be careful not to cut yourself on burrs left on the inside or outside of the pipe. Also be careful not to touch the cut end of the pipe because it will be hot.

Y. Clean work area and store equipment and materials properly

USE POWER TOOLS
UNIT I

JOB SHEET #2 — USE A BENCH GRINDER

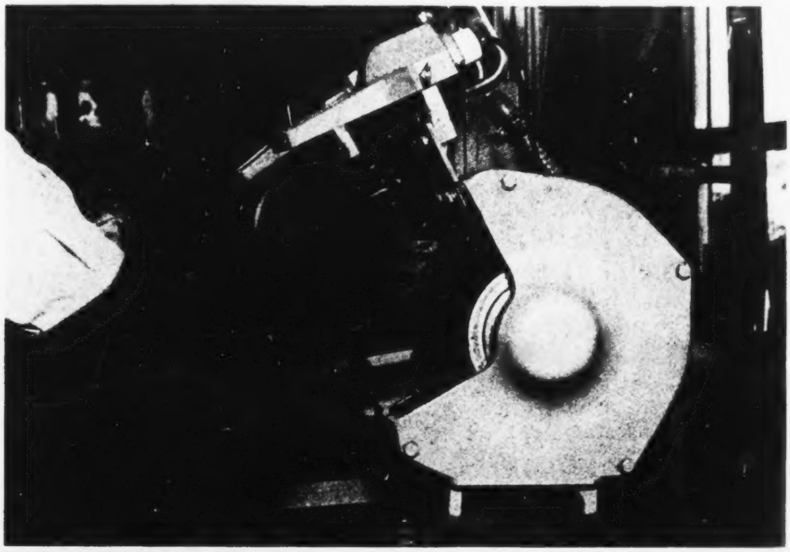
I. Equipment and materials

- A. Bench grinder
- B. Safety glasses and face shield
- C. 18-inch pipe from Job Sheet #1
- D. 14-inch rod from Job Sheet #1
- E. 32-inch rod from Job Sheet #1

II. Procedure

- A. Check grinding wheels to make sure they are not cracked, damaged, or worn; discard and have instructor replace if necessary
- B. Make sure that all tool rests and guards are in place and tight
- C. Put on safety glasses and face shield
- D. Stand to one side of grinder
- E. Turn on grinder
- F. Hold pipe firmly in both hands and place burred end of pipe horizontally on tool rest and at approximately a 45-degree angle to face of grinding wheel (Figure 32)

FIGURE 32



JOB SHEET #2

G. Ease pipe in against face of grinding wheel and turn pipe slowly until burr and sharp outer edge of pipe have been removed

(NOTE: When finished, the end of the pipe should be smooth and free of sharp edges.)

H. Turn off grinder

I. Repeat steps D through H on other end of pipe

J. Repeat steps D through H for ends of rods

K. Take off face shield and safety glasses

L. Clean work area and store equipment and materials properly

USE POWER TOOLS
UNIT I

JOB SHEET #3 — USE A PORTABLE ANGLE GRINDER

I. Equipment and materials

A. One 2"×4" piece of 1/8-inch steel plate that has been cut to dimension with a cutting torch (provided by instructor)

B. Portable angle grinder and grinding wheel

C. Extension cord

D. Vise

E. Safety glasses and face shield

II. Procedure

(NOTE: The steel plate ground in this job sheet may be used to construct an extension-cord stand. Save steel plate and see your instructor for further directions.)

A. Check to see that grinder is unplugged

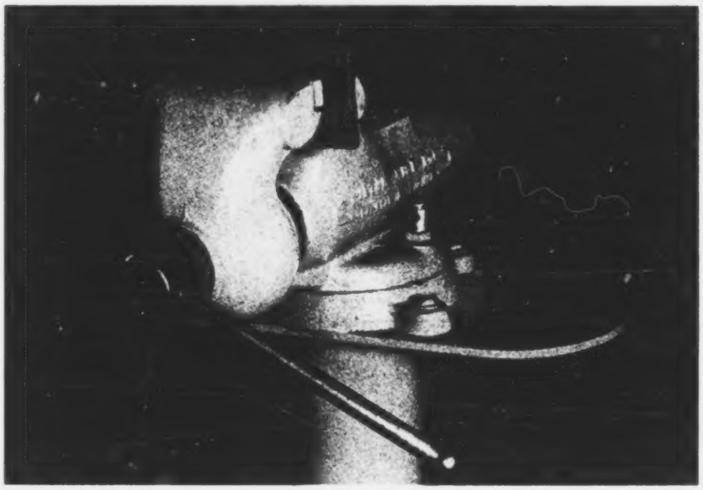
B. Check angle grinder to make sure guard is tight and in place

C. Check grinding wheel to make sure it is not cracked or damaged; discard and have instructor replace if necessary

D. Lay grinder aside on its rest pad

E. Mount 2"×4" steel plate vertically in vise jaws as shown in Figures 33; firmly tighten plate in vise

FIGURE 33



JOB SHEET #3

F. Put on safety glasses and face shield

G. Plug grinder into electrical outlet

H. Grasp grinder firmly in both hands

I. Start grinder by squeezing trigger switch

J. Bring motor to full speed

K. Ease grinding wheel down against top edge of plate while holding grinder parallel to floor

L. Move grinding wheel back and forth across top edge of plate until edge is smooth

M. Lift grinder away from top edge of plate and move grinder to edge of plate that extends beyond jaws of vise (Figure 34)

FIGURE 34

N. Hold grinder vertically with grinding wheel parallel to edge of metal plate; move grinder with an up-and-down motion until edge is smooth

O. Release trigger switch and stop grinding momentarily; evaluate smoothness of edges that have been ground

(NOTE: Be sure to wear leather gloves when you examine the edges for burrs.)

JOB SHEET #3

P. Repeat steps H through O until these two edge have been ground smooth

Q. Grind exposed corner of plate so that it is smooth and slightly rounded

R. Release trigger

S. Be sure wheel of grinder has stopped turning; and lay grinder aside, resting it on its rest pad

T. Adjust plate in vise jaws to expose other two edges of plate

U. Repeat steps H through Q to smooth those two edges and exposed corner

V. Adjust plate in vise to smooth and round remaining two corners

W. Turn off grinder; and lay grinder aside, resting it on its rest pad

X. Remove face shield and safety glasses

Y. Unplug grinder

Z. Clean work area and store equipment and materials properly

USE POWER TOOLS
UNIT I

JOB SHEET #4 — USE A PORTABLE CIRCULAR SAW

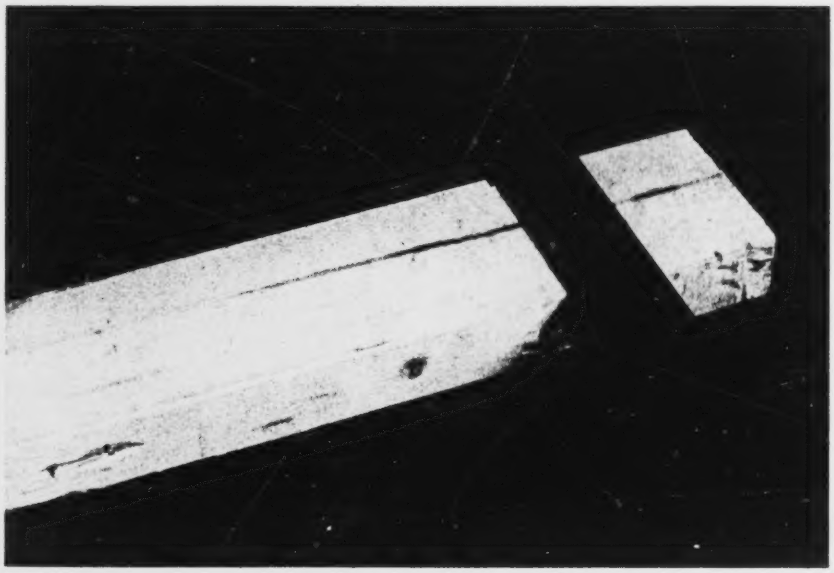
I. Equipment and materials

- A. Portable circular saw and crosscut or combination blade
- B. Extension cord
- C. 1"×4" board that is at least 2 feet long
- D. Pencil
- E. Square
- F. Tape measure
- G. Safety glasses
- H. Workbench

II. Procedure

- A. Check board for nails or any other metal; remove if necessary
- B. Place board wide side (face) down on workbench
- C. Measure and make a short pencil mark 4 inches from one end of board (See Figure 35)
- D. Lay square on board so that one inside edge is on edge of board and other inside edge is on pencil mark (Figure 35)

FIGURE 35



JOB SHEET #4

E. Using inside edge of square as guide, complete pencil mark across face of board

F. Lay square, tape measure, and pencil aside

G. Make sure saw is unplugged

H. Make sure telescoping guard on saw is free and retractable

I. Adjust depth of cut so that saw-blade teeth clear thickness of 1×4

J. Make sure all adjustments are tight

K. Lay board on workbench so that at least 5 inches of board extend beyond edge of workbench

L. Plug saw into electrical outlet

M. Put on safety glasses

N. Place palm of left hand firmly on board approximately 1 foot from edge of workbench

O. Grasp saw by handle with right hand

P. Set front of saw's base (shoe) on board so that guide is in line with pencil mark, but make sure that blade will clear board

Q. Start saw by pulling trigger with your index finger

R. Allow saw to reach maximum speed

S. Ease saw into board, keeping guide in line with pencil mark until cut is complete

(NOTE: If saw blade cuts slowly or if blade smokes, blade is not sharp and must be replaced. Notify your instructor.)

T. Release trigger

U. Allow blade to come to a complete stop

V. Set saw on workbench and unplug saw

W. Remove safety glasses

X. Have instructor evaluate your project

Y. Clean work area and store equipment and materials properly

USE POWER TOOLS
UNIT I

JOB SHEET #5 — USE A DRILL PRESS AND A PORTABLE DRILL

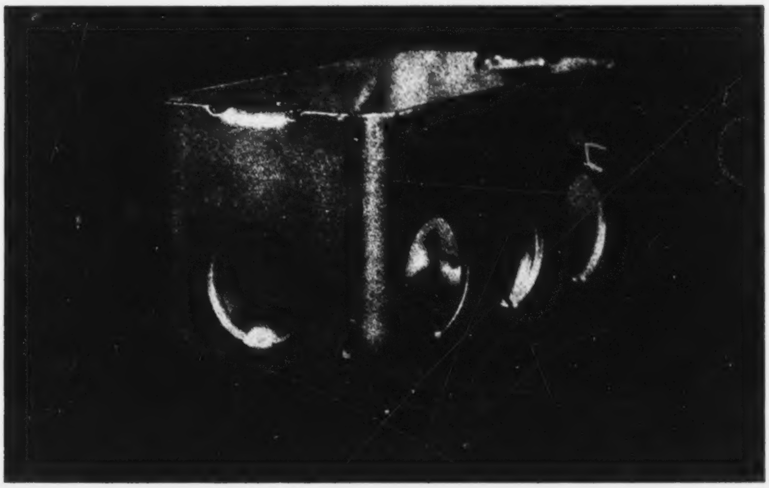
I. Equipment and materials

- A. Drill press and proper chuck key
- B. 3/16-inch drill bit
- C. 2"×4"× 1/8" steel plate from Job Sheet #3
- D. C-clamp
- E. 1"×4" block of wood from Job Sheet #4
- F. Sharp-pointed piece of soapstone
- G. Center punch
- H. Small ball-peen hammer
- I. 2"×4"×2" single duplex-receptacle handy box
- J. Safety glasses
- K. Workbench
- L. Cutting oil for drill press
- M. Portable drill and proper chuck key
- N. Vise
- O. Extension cord

II. Procedure

- A. Lay steel plate on workbench
- B. Set handy box on steel plate with closed back of box against steel plate and with sides aligned (Figure 36)

FIGURE 36



C. Use soapstone to mark through two alternating holes in bottom of handy box onto steel plate

D. Remove box from steel plate

E. Place center punch with sharp end on one soapstone-marked spot

F. Tap head of center punch with ball-peen hammer firmly enough to make an indention in steel plate

G. Repeat steps E and F on remaining marked spot

H. Lay hammer and punch aside

I. Make sure power is turned off to drill press

J. Insert smooth, shank end of drill bit vertically into drill-press chuck; hold drill bit in place and tighten chuck with chuck key

K. Remove chuck key

L. Lay wooden block close to one side of drill-press table

M. Lay steel plate on wooden block so that one long edge of steel plate and wooden block are aligned with edge of table

N. Loosen table-locking clamp just enough to allow table to be moved on column

O. Swing table right or left to locate steel plate under drill bit

P. Feed drill bit down with pilot wheel feed until it is approximately 1/8 inch above steel plate

Q. Slide steel plate and wooden block either forward or backward to align one center-punched mark perfectly with center of drill-bit tip

R. Allow drill bit to return to its normal up position while holding steel plate and wooden block in position

S. Use C-clamp to clamp steel plate and wooden block firmly to drill-press table

T. Follow procedure in step Q to determine that drill point is still centered exactly above center-punched mark

U. Readjust clamp and plate to obtain the correct position as necessary

V. Put on safety glasses

W. Turn on drill press

JOB SHEET #5

X. Ease drill bit down into center-punched mark and hold steady, downward pressure on drill until steel plate is drilled through; apply cutting oil as necessary

(NOTE: If drill bit does not produce many shavings or chips or if drilling is labored, drill bit is not sharp and must be replaced. Check with instructor.)

Y. Allow drill to return to its normal up position

Z. Turn off drill press

AA. Unclamp plate and wooden block

BB. Remove safety glasses

III. Procedure for portable drill

A. Mount steel plate in vise jaws so that the remaining center-punched hole is approximately 1 inch above vise jaws

B. Make sure drill is unplugged

C. Insert smooth, shank end of drill bit vertically into chuck and tighten chuck with chuck key

D. Remove chuck key

E. Plug drill into electrical outlet

F. Put on safety glasses

G. Using both hands, hold drill up to steel plate so that drill bit is perpendicular to plate at center-punched mark

H. Start drill by pressing trigger switch

I. Push drill-bit point into center-punched mark, maintaining firm pressure until steel plate is drilled through; apply cutting oil as necessary

(NOTE: If drill bit does not produce many shavings or chips or if drilling is labored, drill bit is not sharp and must be replaced. Check with your instructor.)

J. With drill still running, back drill bit out of hole

K. Stop drill

L. Unplug drill

M. Remove drill bit from drill chuck

JOB SHEET #5

N. Remove steel plate from vise

O. Remove safety glasses

P. Clean work area and store materials and equipment properly

USE POWER TOOLS
UNIT I

TEST

NAME ______________________________ SCORE ____________

1. Match to their correct definitions terms associated with power tools. Write the correct numbers in the blanks.

______a. Any electrically or pneumatically powered labor-saving device

______b. Item used with a power tool to increase tool's versatility

______c. Item necessary for making something; the whole or greater part of a finished product

______d. Thin ridge or area of roughness produced when cutting or shaping metal

______e. Specially designed instrument used to tighten drill bits into portable drills and drill presses

______f. Rough-textured wheel used on power tools to grind or cut metal

______g. Powered by compressed air

1. Material
2. Chuck key
3. Power tool
4. Burr
5. Accessory
6. Abrasive disc
7. Pneumatic

2. State eight general safety rules pertaining to power tools.

a. ____

b. ____

c. ____

d. ____

e. ____

f. ____

g. ____

h. ____

TEST

3. State five general guidelines for proper care of power tools.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

4. State uses of an abrasive cutoff saw.

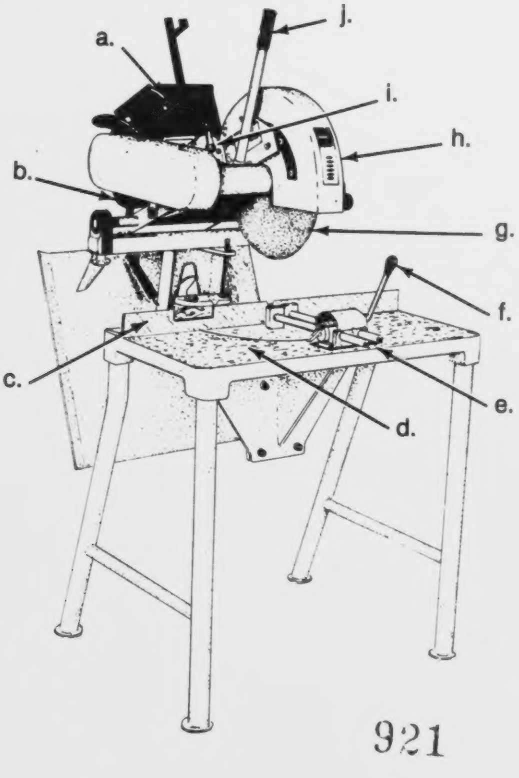
____

5. Identify the parts of the abrasive cutoff saw illustrated below. Write the correct names in the blanks.

Magnetic motor starter
Table
On/off switch
Motor

Fence
Handle
Vise handle

Abrasive disc
Cam-clamp vise
Disc guard



a. ______________

b. ______________

c. ______________

d. ______________

e. ______________

f. ______________

g. ______________

h. ______________

i. ______________

j. ______________

TEST

6. State four rules for safe use of an abrasive cutoff saw.

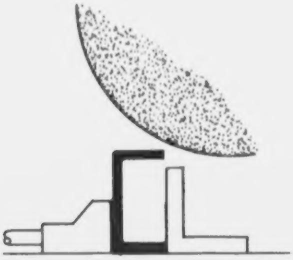
   a.

   b.

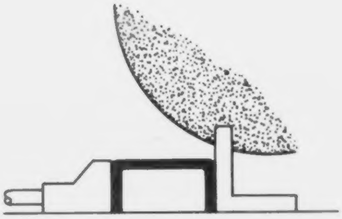
   c.

   d.

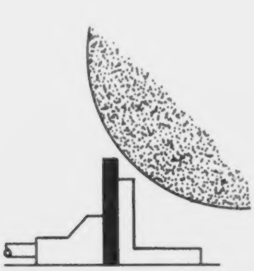
7. Distinguish between proper and improper vise holding-positions for metal stock in an abrasive cutoff saw. Write a "C" in the blanks under illustrations of correct holding positions and an "I" in the blanks under incorrect holding positions.



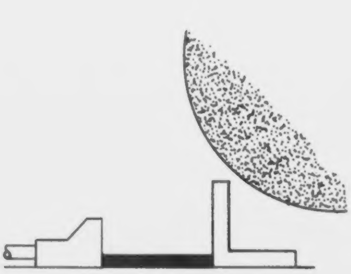
a.



b.

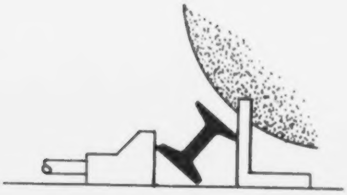


c.

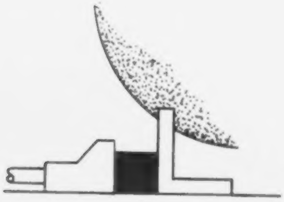


d.

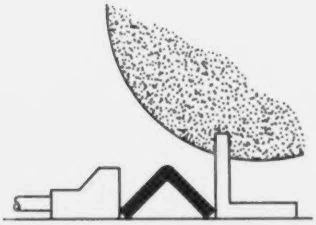
TEST



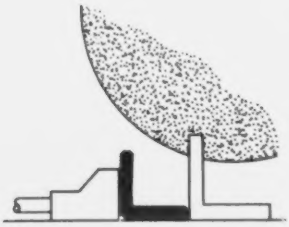
e. ____________________



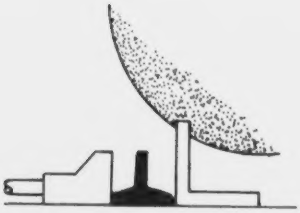
f. ____________________



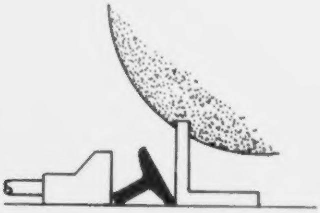
g. ____________________



h. ____________________



i. ____________________



j. ____________________

8. State uses of a bench grinder.

____

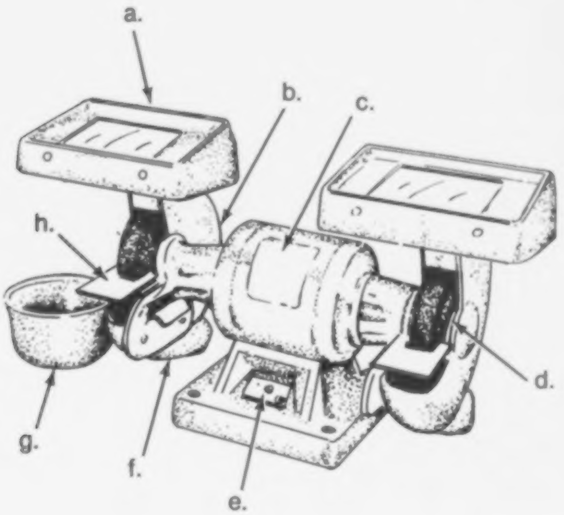
____

____

TEST

9. Identify the parts of the bench grinder illustrated below. Write the correct names in the blanks.

Eye shield	**Dust chute**
Wheel	**Switch**
Tool rest	**Guard**
Water pot	**Motor**



a. ______________________ e. ______________________

b. ______________________ f. ______________________

c. ______________________ g. ______________________

d. ______________________ h. ______________________

10. State six rules for safe use of a bench grinder.

a. ____

____

b. ____

____

c. ____

____

TEST

d. ______________________________

____

e. ______________________________

____

f. ______________________________

____

11. State uses of a portable angle grinder.

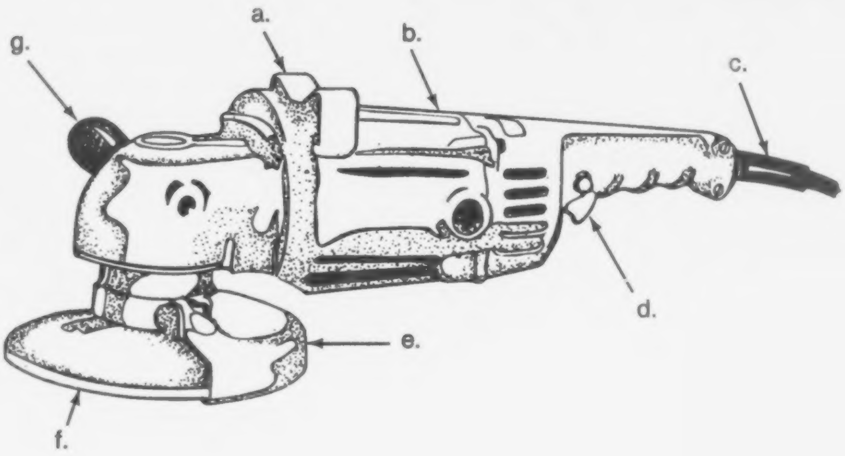
____

____

____

12. Identify the parts of the portable angle grinder illustrated below. Write the correct names in the blanks.

Side handle
Grinding wheel
Rest pad
Electric cord
Motor
Trigger switch
Safety guard



a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

TEST

13. State five rules for safe use of a portable angle grinder.

a. ______________________________

____

____

b. ______________________________

____

____

c. ______________________________

____

____

d. ______________________________

____

____

e. ______________________________

____

____

14. Distinguish between uses of a cup grinding wheel and a wire-cup brush. Write an "X" in the blank before the uses of a cup grinding wheel.

_____a. Used to remove rust, scale, and paint from metal and to clean metal

_____b. Used to grind all types of metal

15. State uses of a portable circular saw.

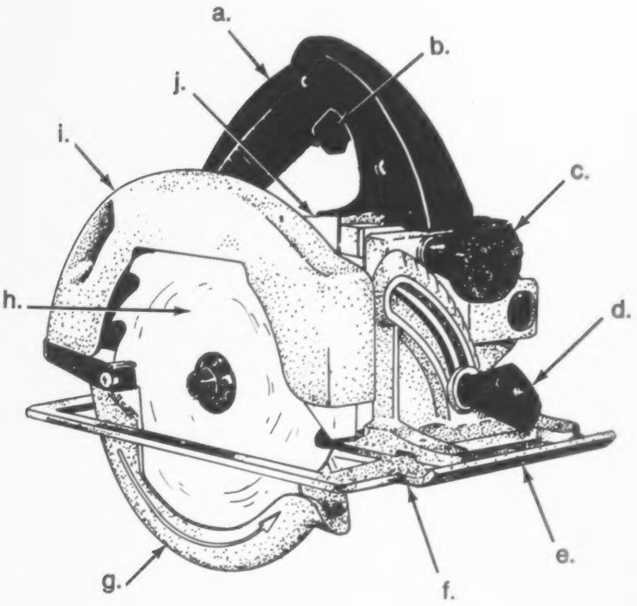
____

____

TEST

16. Identify the parts of the portable circular saw illustrated below. Write the correct names in the blanks.

Handle
Depth-adjustment knob
Guide
Upper guard
Blade
Motor
Tilt adjustment
Base (shoe)
Telescoping guard
Switch



a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

h. ____________________

i. ____________________

j. ____________________

TEST

17. State five rules for safe use of a portable circular saw.

    a.

    b.

    c.

    d.

    e.

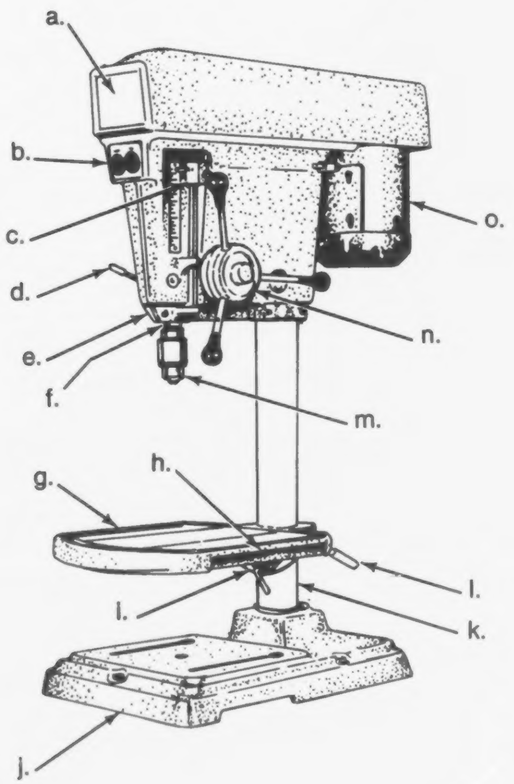
18. State the use of the rip-guide accessory of a portable circular saw.

19. State uses of a drill press.

TEST

20. Identify the parts of the drill press illustrated below. Write the correct names in the blanks.

Safety guard for belt and pulley
Quill lock
Clamp ledge
Column
Chuck
Push-button switch
Quill
Tilting table
Lower table (base)
Pilot wheel feed
Depth stop
Threaded mounting collar
Tilt-angle scale
Table-locking clamp
Motor



a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

g. ______________________________

h. ______________________________

i. ______________________________

j. ______________________________

k. ______________________________

l. ______________________________

m. ______________________________

n. ______________________________

o. ______________________________

TEST

21. State five rules for safe use of a drill press.

    a. ______________________________

    b. ______________________________

    c. ______________________________

    d. ______________________________

    e. ______________________________

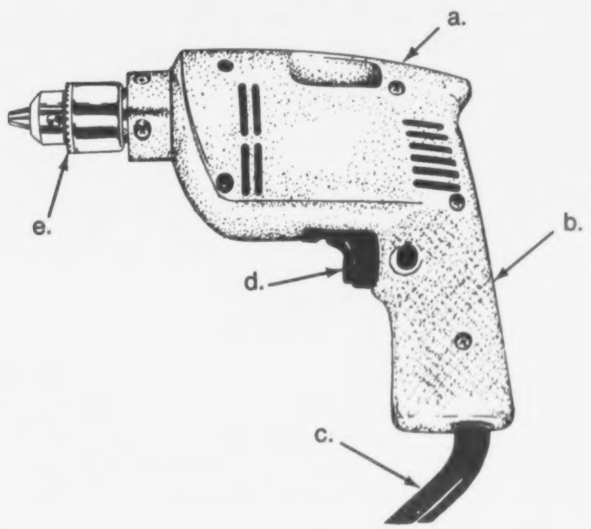
22. State uses of a portable drill.

    ____

    ____

23. Identify the parts of the portable drill illustrated below. Write the correct names in the blanks.

Chuck
Motor
Trigger switch
Electric cord
Pistol-grip handle



a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

TEST

24. State eight rules for safe use of a portable drill.

a. ______________________________

____

b. ______________________________

____

c. ______________________________

____

d. ______________________________

____

e. ______________________________

____

f. ______________________________

____

g. ______________________________

____

h. ______________________________

____

25. Match accessories for drill presses and portable drills to their correct uses. Write the correct numbers in the blanks. Some blanks will contain more than one answer. Accessories and uses continue on the next page.

_____a. Used with portable drill to allow drilling in tight spots

_____b. Used with drill press or portable drill to drill all materials except masonry products

_____c. Used with drill press or portable drill to drill masonry, brick, stone, plaster, or slate

_____d. Used with portable drill to allow it to function as a drill press

1. Portable-drill stand
2. Right-angle drill attachment
3. Masonry bit
4. Twist drill bit

TEST

_____e. Used with portable drill to remove paint and rust and to clean metal

_____f. Used with drill press to hold material being drilled

_____g. Used with drill press or portable drill to drill holes in wood or wood products, plastic, or plastic laminate

_____h. Used with drill press or portable drill to cut holes in material

5. Hole saw
6. Flat boring bit
7. Wire-cup brush
8. Wire-wheel brush
9. Drill-press vise

(NOTE: Test items 26 and 27 list the assignment sheet and job sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

26. Complete a safety test on general safety rules for power tools and for each of the six power tools commonly used in agricultural mechanics.

27. Demonstrate the ability to

    a. Use an abrasive cutoff saw.

    b. Use a bench grinder.

    c. Use a portable angle grinder.

    d. Use a portable circular saw.

    e. Use a drill press and a portable drill.

USE POWER TOOLS
UNIT I

ANSWERS TO TEST

1. a. 3
   b. 5
   c. 1
   d. 4
   e. 2
   f. 6
   g. 7

2. Answer should include any eight of the following

   a. Do not attempt to operate any power tool before being checked out by instructor on that particular tool
   b. Always wear eye protection when operating a power tool
   c. Wear appropriate clothing for job being done
   d. Do not distract others or let anyone distract you while operating a power tool
   e. Do not leave power tool running unattended
   f. Assume a safe and comfortable position before using a power tool
   g. Be sure that power tool is properly grounded before using
   h. Be sure that power tool is disconnected before performing maintenance, changing accessories, or making adjustments
   i. Do not use dull or broken tool or accessories
   j. Use a power tool only for its intended use
   k. Keep feet, fingers, and hair away from the blade and other moving parts of a power tool
   l. Do not use a power tool with guards or safety devices removed
   m. Do not operate a power tool if hands or feet are wet
   n. Keep work area clean at all times
   o. Read operator's manual and become familiar with the correct operation and adjustments of a power tool before attempting to use it
   p. Keep a firm grip on the power tool at all times
   q. Use electric extension cords of sufficient size to service particular power tool you are using
   r. Be sure compressor, air lines, and connections on pneumatic tools are in good repair and without leaks
   s. Immediately report any unusual noises, sounds, or vibrations to the instructor

3. Answer should include any five of the following

   a. Keep tools clean and in good working order
   b. Keep machine surfaces clean
   c. Follow manufacturer's maintenance procedures
   d. Protect cutting edges
   e. Keep tool accessories, such as blades and bits, sharp
   f. Always use appropriate blade for arbor size
   g. Inspect tools and accessories regularly
   h. Keep tools in their proper place when not in use

ANSWERS TO TEST

4. Used to cut bar stock, tubing, and structural steel

5. a. Magnetic motor starter
   b. Motor
   c. Fence
   d. Table
   e. Cam-clamp vise
   f. Vise handle
   g. Abrasive disc
   h. Disc guard
   i. On/off switch
   j. Handle

6. Answer should include any four of the following

   a. Check abrasive disc and discard disc if it has cracks or missing chunks
   b. Clamp materials firmly in cam-clamp vise before cutting
   c. Support long material to keep it from falling once cut is complete
   d. Allow saw to reach full operating speed before beginning cut
   e. Ease blade into material; do not force blade
   f. Maintain a continuous, steady pressure while cutting
   g. Always wear face shield and safety glasses when operating abrasive cutoff saw

7. a. I
   b. C
   c. C
   d. I
   e. I
   f. C
   g. C
   h. I
   i. I
   j. C

8. Used to sharpen, shape, and recondition hand tools and to grind, deburr, smooth, clean, and shape metal

9. a. Eye shield
   b. Guard
   c. Motor
   d. Wheel
   e. Switch
   f. Dust chute
   g. Water pot
   h. Tool rest

10. Answer should include any six of the following

    a. Do not grind woods or plastics
    b. Never use grinder with a cracked or damaged wheel
    c. Never use a grinder with a wheel that vibrates excessively
    d. Never wear gloves when using a bench grinder
    e. Do not use a grinding wheel that is worn to less than one-half of its original diameter
    f. Never use the side of the grinding wheel for grinding
    g. Never use grinder to remove paint
    h. Do not grind materials that are small enough to allow your fingers to contact the grinding wheel

ANSWERS TO TEST

i. Always use tool rest
j. Adjust tool rest so that it is not more than $^1/_8$ inch from wheel and slightly above center
k. Stand to one side when starting the grinder
l. Allow grinder to come to full speed before starting to grind
m. Always wear face shield and safety glasses when grinding

11. Used to clean, shape, deburr, and smooth rough edges on metal; and to grind and smooth welds

12. a. Rest pad
b. Motor
c. Electric cord
d. Trigger switch
e. Safety guard
f. Grinding wheel
g. Side handle

13. Answer should include any five of the following

a. Wear gloves when appropriate
b. Use proper grinding wheel for material being ground
c. Do not operate grinder if guards are missing
d. Do not use grinder if wheel vibrates excessively
e. Never use a grinder with cracked or damaged wheel
f. Always wear face shield and safety glasses when grinding
g. Always hold grinder with both hands
h. Make sure work material is held in position firmly before beginning to grind
i. Bring motor to full speed before beginning to grind
j. Feed grinding wheel lightly into work material
k. Be sure that wheel has stopped turning before laying grinder down
l. Lay grinder on its rest pad so that nothing touches grinding wheel while grinder is not in use

14. b

15. Used to crosscut, rip, miter, and bevel lumber, wood products, wood by-products, and plastic

16. a. Handle
b. Switch
c. Depth-adjustment knob
d. Tilt adjustment
e. Base (shoe)
f. Guide
g. Telescoping guard
h. Blade
i. Upper guard
j. Motor

ANSWERS TO TEST

17. Answer should include any five of the following

    a. Make sure telescoping guard is free and retractable
    b. Check material for nails and any other metal before cutting
    c. Use appropriate blade for cut to be made
    d. Use good, solid support for material being cut
    e. Use only sharp blades
    f. Make sure all adjustments are tight and are readjusted as necessary
    g. Wear safety glasses or other appropriate eye protection when operating saw
    h. Do not saw in awkward positions
    i. Adjust depth of cut so that saw-blade teeth clear thickness of material by the depth of the teeth
    j. Do not attempt to make curved cuts
    k. Allow saw to reach maximum speed before advancing it into material
    l. Do not release starting trigger if saw stalls; back saw out and determine why saw is binding

18. Used to help maintain straight cuts during ripping

19. Used to drill and bore wood and all types of steel

20. a. Safety guard for belt and pulley
    b. Push-button switch
    c. Depth stop
    d. Quill lock
    e. Threaded mounting collar
    f. Quill
    g. Tilting table
    h. Clamp ledge
    i. Tilt-angle scale
    j. Lower table (base)
    k. Column
    l. Table-locking clamp
    m. Chuck
    n. Pilot wheel feed
    o. Motor

21. Answer should include any five of the following

    a. Check drill to be sure it is sharp
    b. Never wear gloves while operating drill press
    c. Place a block of wood under work material to prevent damage to table or vise
    d. Clamp work material securely in proper work-holding device
    e. Support long material
    f. Place long end of material to left so it will hit post and not operator should material slip and start rotating
    g. Use center punch to mark point where drill tip will be started
    h. Drill pilot hole for holes that will be larger than 3/8 inch
    i. Wear safety glasses or other appropriate eye protection when drilling
    j. Always remove chuck key before turning on power
    k. Use correct speed for job being performed
    l. Do not force drill into material
    m. Use cutting oil when drilling into steel

ANSWERS TO TEST

22. Used to drill and bore wood and all types of steel; to drive screws; and to mix material

23. a. Motor
    b. Pistol-grip handle
    c. Electric cord
    d. Trigger switch
    e. Chuck

24. Answer should include any eight of the following

    a. Select the proper drill size for the job
    b. Check drill to be sure it is sharp
    c. Use center punch to mark point where drill tip will be started
    d. Securely fasten material to table
    e. Tighten chuck securely on drill
    f. Always remove chuck key before turning on power
    g. Wear safety glasses or other appropriate eye protection when drilling
    h. Use correct speed for job being performed
    i. Allow drill motor to come to full speed before beginning drilling process
    j. Hold drill at right angle during drilling process
    k. Do not force drill into material
    l. Maintain even, steady pressure during drilling process
    m. Ease off pressure as drill starts to break through material
    n. Never attempt to stop drill by taking hold of chuck
    o. On deep cuts, back drill out often to clean out hole
    p. Never point drill at anyone

25. a. 2
    b. 4
    c. 3
    d. 1
    e. 7, 8
    f. 9
    g. 6
    h. 5

26. Evaluated to the satisfaction of the instructor

27. Performance skills evaluated to the satisfaction of the instructor

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

UNIT OBJECTIVE

After completing this unit, the student should be able to construct various types of welds in a variety of positions, using the shielded metal-arc welding process. The student should also be able to troubleshoot problems that may be encountered when welding. The student will show this ability by completing the assignment sheet, job sheets, and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with position shielded metal-arc welding.
2. Match to their correct definitions abbreviations associated with position shielded metal-arc welding.
3. Label parts of a plate joint.
4. Identify common groove weld joints.
5. Identify welding positions.
6. List factors that determine a good weld.
7. Select from a list factors that determine proper setting for a welding machine.
8. Match common welding problems to their correct descriptions.
9. State causes of common welding problems.
10. State causes of improperly formed beads.
11. List techniques used when making multiple passes.
12. State methods of protection from hazards in arc welding.
13. Analyze poor welds.
14. Demonstrate the ability to
    a. Make a pad in the horizontal position.
    b. Make a single-V-groove butt weld in the horizontal position.

OBJECTIVE SHEET

c. Make a single-V-groove butt weld in the vertical-up position.

d. Make a single-V-groove butt weld in the overhead position.

e. Make a T-joint fillet weld in the vertical-up position.

f. Make a square-groove butt-joint weld in the vertical-down position.

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

SUGGESTED ACTIVITIES

I. Unit contents

- A. Objective sheet
- B. Suggested activities
    1. Supplements
        - a. Supplement #1 — SMAW Welding Set-Up
        - b. Supplement #2 — Lens-Shade Selector
    2. Transparency masters
        - a. TM #1 — Parts of a Plate Joint
        - b. TM #2 — Common Types of Groove Joints and the Welding Symbols for Each
        - c. TM #3 — Welding Positions
        - d. TM #4 — Weld Quality Inspection: Good Welds
        - e. TM #5 — Common Welding Problems
        - f. TM #6 — Common Welding Problems (Continued)
        - g. TM #7 — Common Welding Problems (Continued)
        - h. TM #8 — Improperly Formed Beads
        - i. TM #9 — Correct and Incorrect Bead Laps
- C. Information sheet
- D. Assignment Sheet #1 — Analyze Poor Welds
- E. Job sheets
    1. Job Sheet #1 — Make a Pad in the Horizontal Position
    2. Job Sheet #2 — Make a Single-V-Groove Butt Weld in the Horizontal Position
    3. Job Sheet #3 — Make a Single-V-Groove Butt Weld in the Vertical-Up Position

SUGGESTED ACTIVITIES

4. Job Sheet #4 — Make a Single-V-Groove Butt Weld in the Overhead Position
5. Job Sheet #5 — Make a T-Joint Fillet Weld in the Vertical-Up Position
6. Job Sheet #6 — Make a Square-Groove Butt-Joint Weld in the Vertical-Down Position

F. Test

G. Answers to test

II. Instructor's guide

A. Review unit and plan presentation.

B. Obtain materials to supplement unit.

1. Films
   a. *Vertical and Overhead Welding*. Color, 10 minutes, 1976. Available from Films, Inc., 733 Green Bay Road, Wilmette, Illinois 60091.
   b. *Weld 38, 031*. Color, 11 minutes, 1972. Available from Pendleton Productions, Anchorage, Alaska 99501.

   (NOTE: The above films are available to Oklahoma teachers on a free-loan basis. Oklahoma teachers may order from the Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074. Out-of-state teachers must order from the addresses listed with the films.)

2. Plastic mold set of correct and incorrect welds

   (NOTE: A plastic mold set of welds is available from Hobart Bros., 600 West Main, Troy, Ohio 45373; phone: 513-339-6000. Contact Hobart Bros. to verify cost, but the approximate cost will be $8.00.)

3. Sample welds for Assignment Sheet #1
4. Equipment and materials for job-sheet tasks
5. Competency profiles

   (NOTE: Competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

SUGGESTED ACTIVITIES

C. Introduce unit.

SUGGESTIONS:

- Discuss the position-welding techniques the students will be learning in this unit. Point out that students with proficient welding skills save money by making repairs for themselves instead of having to hire welding work done.
- Have a welder speak to the class about how the welding techniques they learn in this unit may be used in a production welding career.
- Have students study the arc-welding unit in *Vocational Agriculture I* to review basic information not covered in this unit. Compare the flat position welding techniques they learned in *Vocational Agriculture I* to the ones they will learn in this unit.

D. Provide students with unit.

E. Discuss unit and specific objectives.

F. Discuss information, assignment, and job sheets.

1. Use Information Sheet, Sections I and II to discuss terms and abbreviations associated with position shielded metal-arc welding.

   SUGGESTIONS:

   - Show the class weld samples to demonstrate terms such as *spatter, penetration,* and *fusion.*
   - Have an experienced welder provide examples of electrodes, flux, and coupons; demonstrate the terms *shielded metal-arc welding, arc, arc length,* and *polarity;* and discuss the abbreviations presented in Section II. Have the welder address how all terms and abbreviations pertain to production welding and preparing test welds and coupons.

2. Use Information Sheet, Sections III and IV to discuss the parts of a plate joint and common groove weld joints.

   SUGGESTIONS:

   - Use Transparency #1 to illustrate your discussion of the parts of a plate joint.
   - Use Transparency #2 to illustrate your discussion of common types of groove joints and the welding symbols for those joints. Point out to students that the joints shown in the information sheet are only some of the most common types of groove joints. Explain to students that although they will not be tested on welding symbols in this unit, knowledge of welding symbols is very important in production welding and that they must become familiar with these symbols if they want to work as production welders.

SUGGESTED ACTIVITIES

3. Use Information Sheet, Section V to discuss welding positions.

   SUGGESTIONS:

   - Use Transparency #3 to illustrate positions, or go to the shop and demonstrate the various welding positions, stressing the circumstances that dictate when a particular position might be used.

   - Explain to students why the heat requirements for a job may change in different welding positions.

4. Use Information Sheet, Sections VI and VII to discuss the factors that determine a good weld and the factors that determine the proper setting for a welding machine.

   SUGGESTIONS:

   - Give the class copies of Supplement #1 to help show all the variables involved in making a good weld: welding machine and circuit, electrode, arc length, and electrode movement.

   - Explain to the class that to make a good weld, the operator must adjust the machine to produce a direct current of sufficient strength to travel through the welding circuit, jump the arc gap, melt the electrode, and create a molten puddle in the base metal. The operator will also vary the current of the machine and the direction of the current travel to suit the job being done.

   - Show the class Transparency #4. Stress to students the importance of producing a quality weld. Explain what you expect from them as far as acceptable levels of proficiency.

   - Explain to students that the information in Section VII should be used as a mental checklist before setting the welding machine for a particular welding job.

5. Use Information Sheet, Sections VIII through X to discuss common welding problems, their causes, and causes of improperly formed beads.

   SUGGESTIONS:

   - Stress the importance of knowing what to do when you are having problems producing a quality weld.

   - Show the class Transparencies #5 through #8 or the plastic mold set from Hobart Bros. to discuss welding problems and improperly formed beads. Then go to the shop and demonstrate the causes of each problem and how to troubleshoot to correct each problem.

SUGGESTED ACTIVITIES

- Discuss Assignment Sheet #1. Explain to students that the corrective procedures listed in the table are *possible* solutions to welding problems. Other solutions may apply, and students should be able to use good judgment in determining solutions to problems after they have practiced welding techniques.
- Have students complete Assignment Sheet #1.

6. Use Information Sheet, Section XI to discuss techniques used when making multiple passes.

SUGGESTIONS:

- Stress that when multiple passes must be made, removing slag permits better fusion of the beads and improves the appearance of the bead.
- Use Transparency #9 to illustrate a discussion of proper bead lap when making multiple passes. Explain that proper lapping increases the strength of the weld, improves penetration, and improves the appearance of the weld.

7. Use Information Sheet, Section XII to discuss hazards in arc welding and the methods used for protection against those hazards.

SUGGESTIONS:

- Stress that arc welding does present some hazards, but if it is performed with proper safety equipment, any injury from those hazards may be avoided.
- Have students review the safety precautions in Section III of the Information Sheet in the "Arc Welding" unit of *Vocational Agriculture I*.
- Review your shop policies and procedures for safety when welding.
- Give students copies of Supplement #2 and discuss the proper lens shade to be used in arc welding.

G. Show the films *Vertical and Overhead Welding* and *Weld 38, 031* to link the information sheet to the job sheets.

H. Demonstrate the techniques used in the job sheets.

I. Have students complete the job sheets and turn in their finished plates.

J. Evaluate plates and return to students.

K. Give test.

L. Critique test and discuss in class.

SUGGESTED ACTIVITIES

M. Reteach and retest as necessary.

N. Complete appropriate section of competency profiles.

III. Unit references

A. Althouse, Andrew D., Carl H. Turnquist, and William A. Bowditch. *Modern Welding.* South Holland, Illinois: The Goodheart-Willcox Co., Inc., 1980.

B. Braker, Clifton R. "Pete". *Vocational Agriculture II,* rev. ed. Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1975.

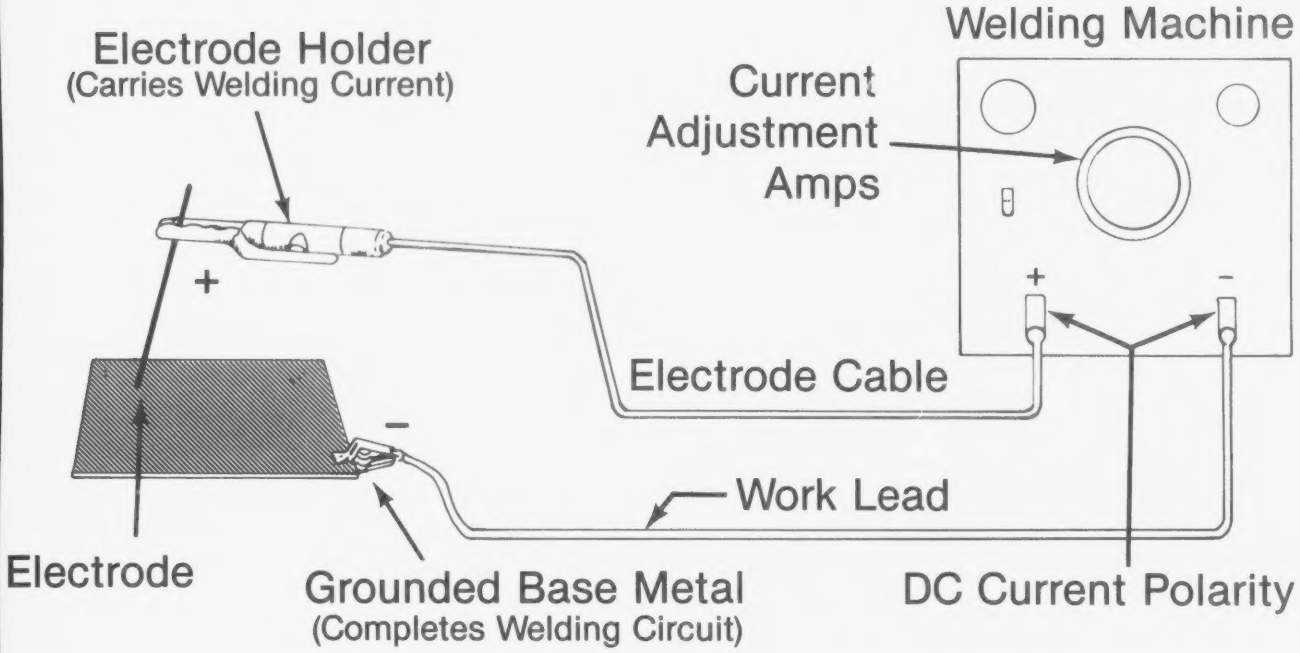
C. Fortney, Clarence, and Mike Gregory. *Shielded Metal Arc Pipe Welding.* Stillwater, Oklahoma: Mid-American Vocational Curriculum Consortium, Inc., 1984.

D. Harp, Keith, and Bob Patton. *Vocational Agricultural I.* Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1984.

E. Smith, Eddie. *Agricultural Mechanics.* Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1977.

SUGGESTED ACTIVITIES

SUPPLEMENT #1 — SMAW WELDING SET-UP


Welding Machine
Electrode Holder
(Carries Welding Current)
Current
Adjustment
Amps
+
+
−
Electrode Cable
−
Work Lead
Electrode
Grounded Base Metal
(Completes Welding Circuit)
DC Current Polarity

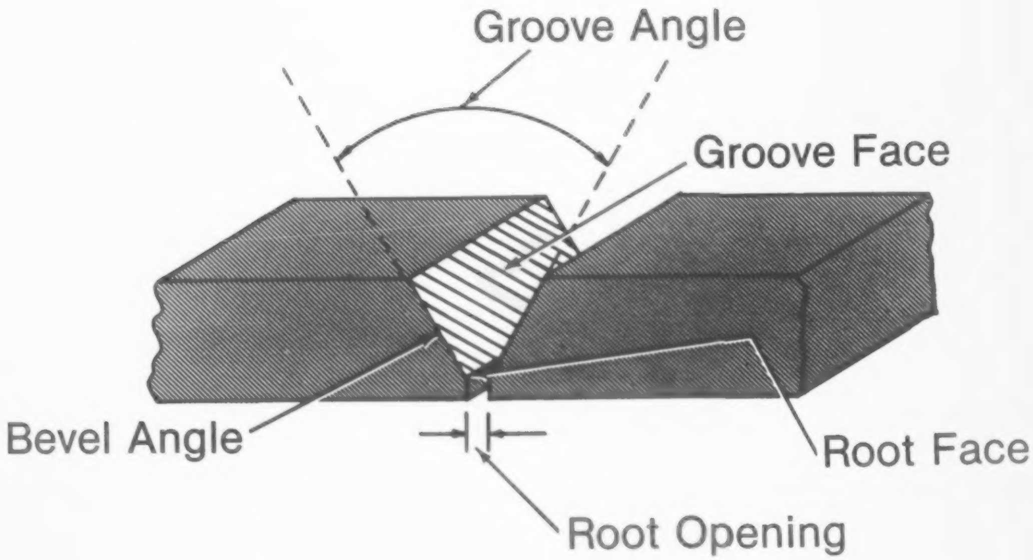
SUGGESTED ACTIVITIES

SUPPLEMENT #2 — LENS-SHADE SELECTOR

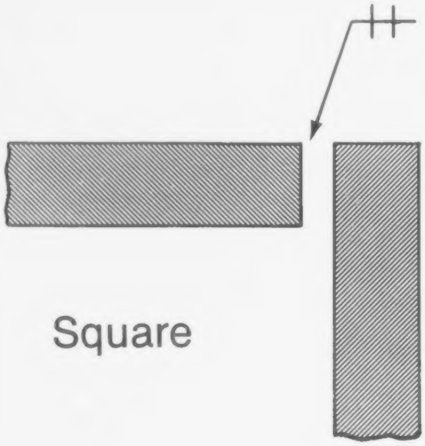
Type of operation	Shade number
Soldering	2
Torch brazing	3 or 4
Oxygen cutting	
Base-metal thickness	
0 to 1 inch	3 or 4
1 to 6 inches	4 or 5
6 inches and over	5 or 6
Gas welding	
Base-metal thickness	
0 to $1/8$ inch	4 or 5
$1/8$ to $1/2$ inch	5 or 6
$1/2$ inch and over	6 or 8
Shielded metal-arc welding $1/16$-, $3/4$-, $1/8$-, $5/32$-inch electrodes	9 to 14
Gas-metal arc welding	9 to 14
Gas-tungsten arc welding (nonferrous), gas-metal arc welding (nonferrous) $1/16$-, $3/32$-, $1/8$-, $5/32$-inch electrodes	9 to 14
Gas-tungsten arc welding (ferrous), gas-metal arc welding (ferrous) $1/16$-, $3/32$-, $1/8$-, $5/32$-inch electrodes	9 to 14

(NOTE: In oxyacetylene welding and cutting, lens-shade requirements are based on metal thickness, but in gas-shielded arc welding, lens-shade requirements are based on electrode size, the amperage range of the electrode, and base-metal properties.)

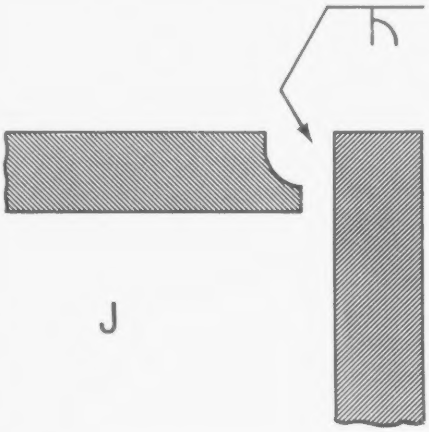
Parts of a Plate Joint


Groove Angle
Groove Face
Bevel Angle
Root Face
Root Opening

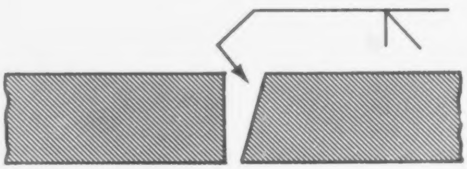
Common Types of Groove Joints and the Welding Symbols for Each



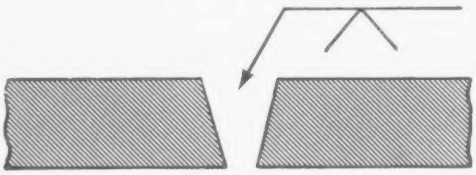
Square



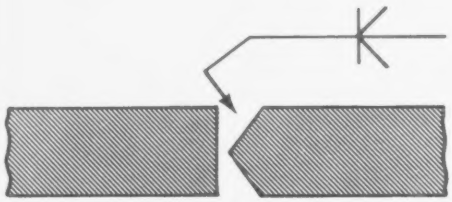
J



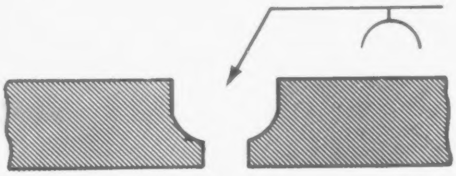
Single-Bevel



Single-V

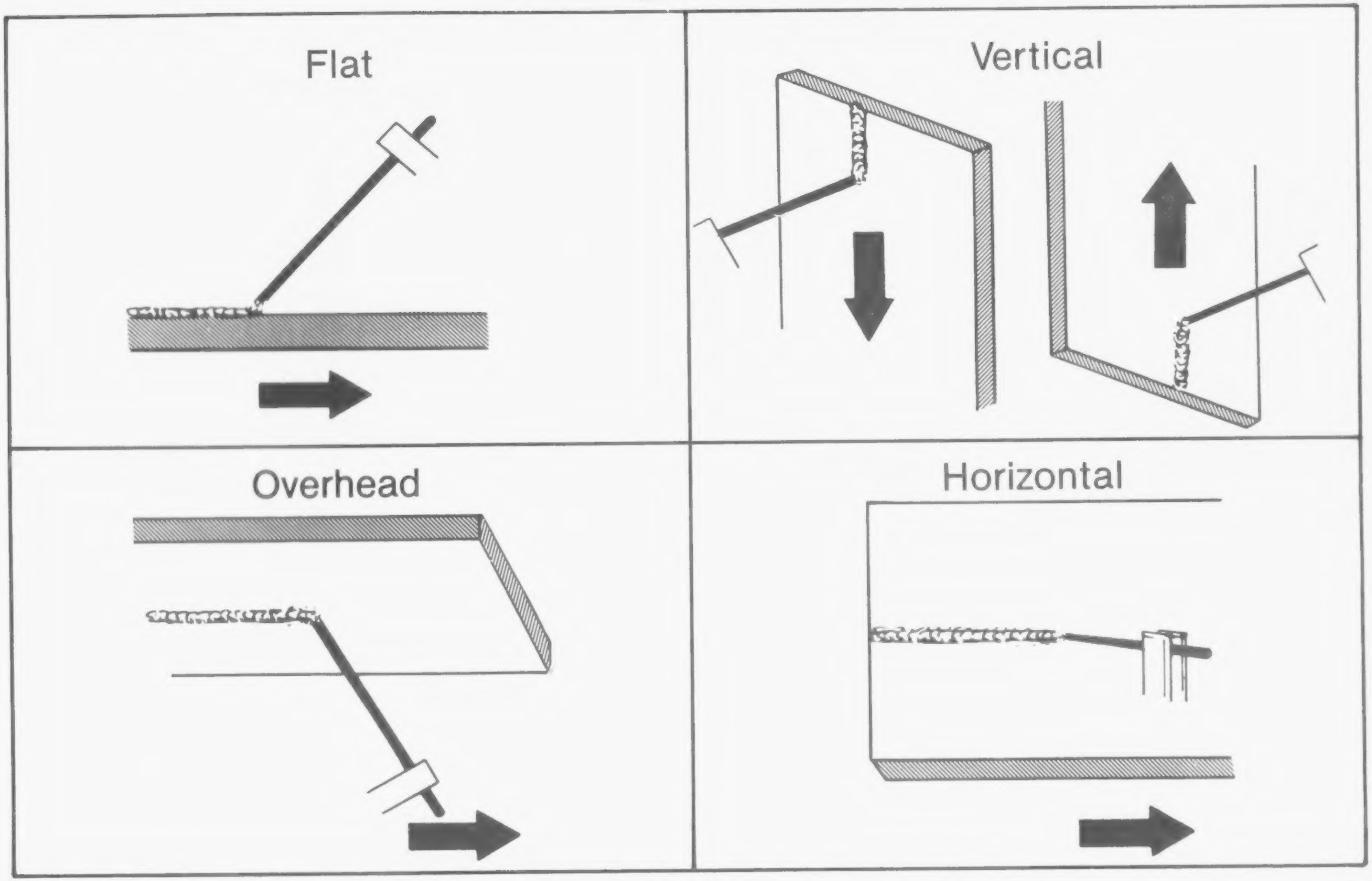


Double-Bevel



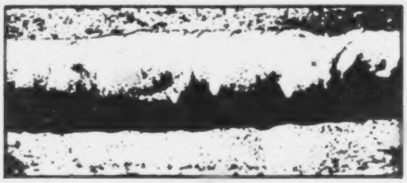
U

Welding Positions


Flat
Vertical
Overhead
Horizontal

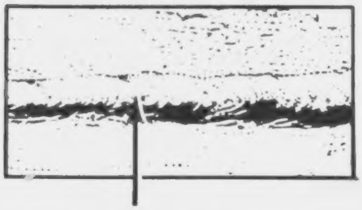
Weld Quality Inspection: Good Welds

Top View



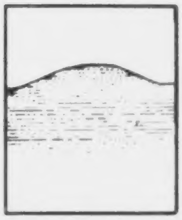
Even Ripple

Top View



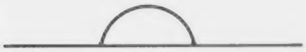
Slight Crown

End View



Even Penetration
(Well-Fused)

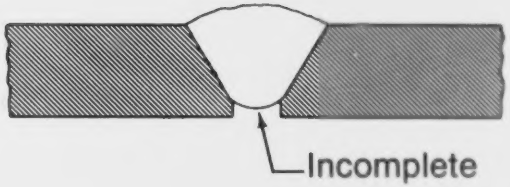
End View

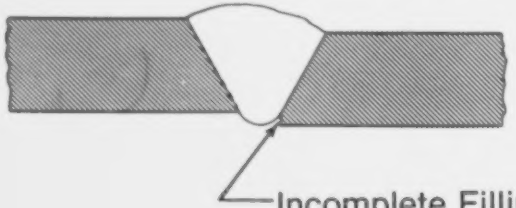


Correct Bead Size

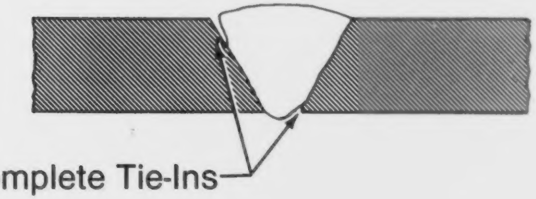
Common Welding Problems

Inadequate Penetration

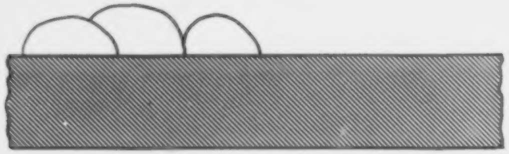

Incomplete
Filling at Root


Incomplete Filling
at Root on One Side Only

Incomplete Fusion


Incomplete Tie-Ins

Cold Lap

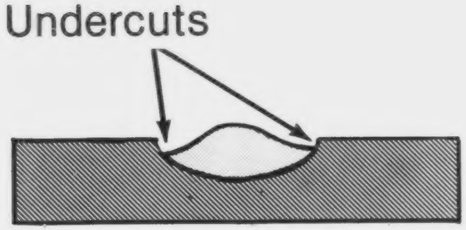


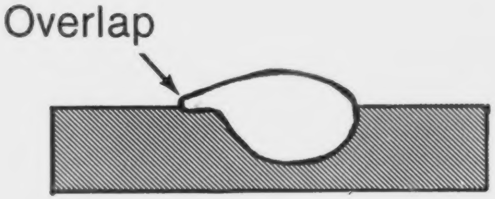
Figures illustrating inadequate penetration and incomplete fusion used with permission of American Petroleum Institute.

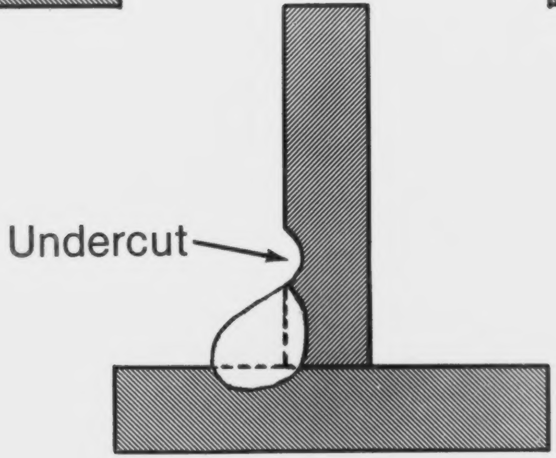
Common Welding Problems

(Continued)

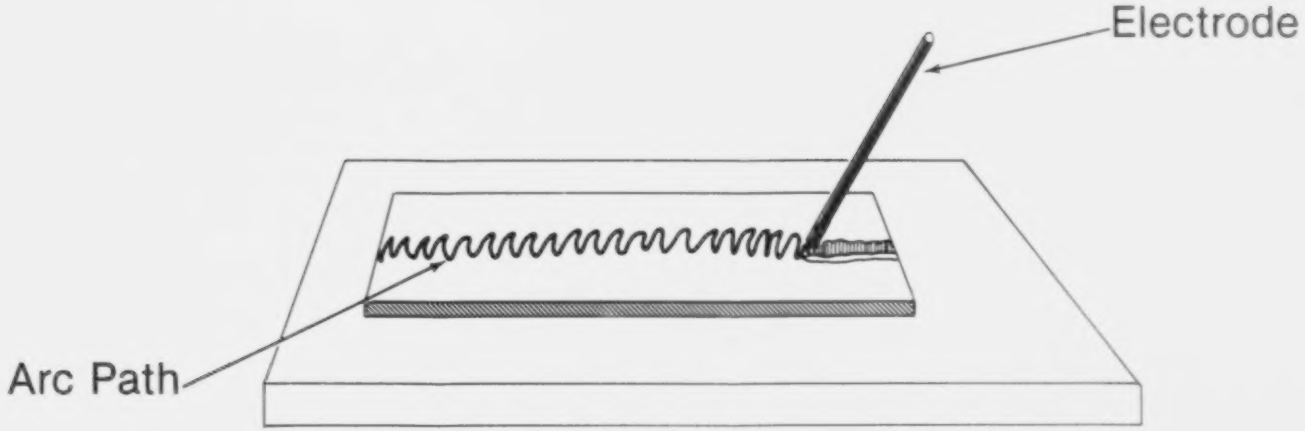
Undercutting and Overlap





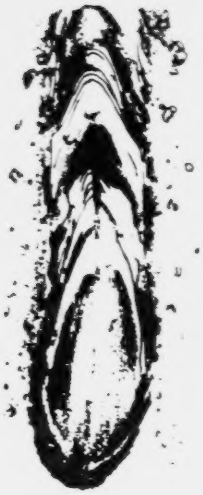


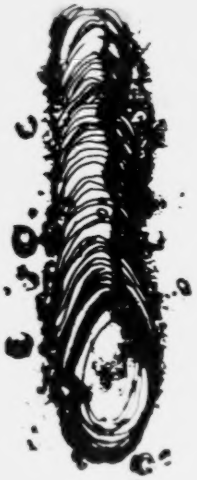
Common Welding Problems
(Continued)

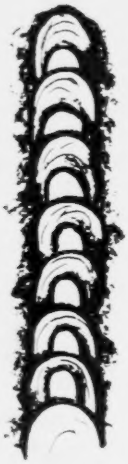

Electrode
Arc Path

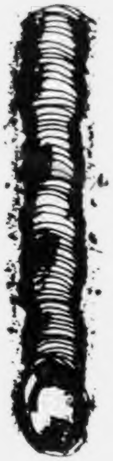
Arc Blow

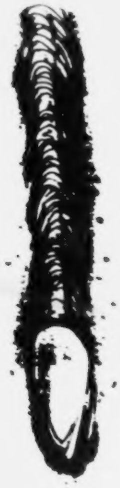
Improperly Formed Beads

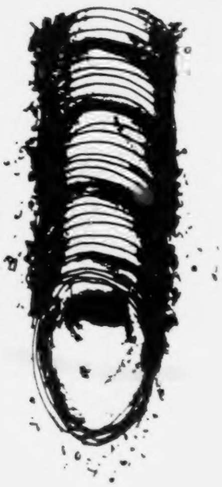

Voltage High


Current High

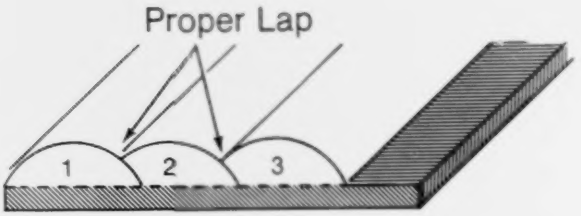

Speed Fast


Voltage Low

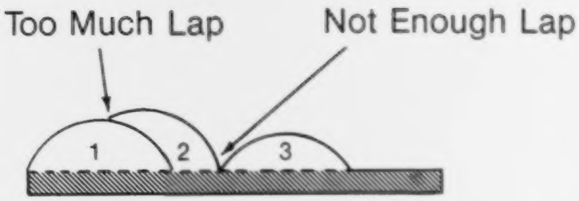

Current Low


Speed Slow

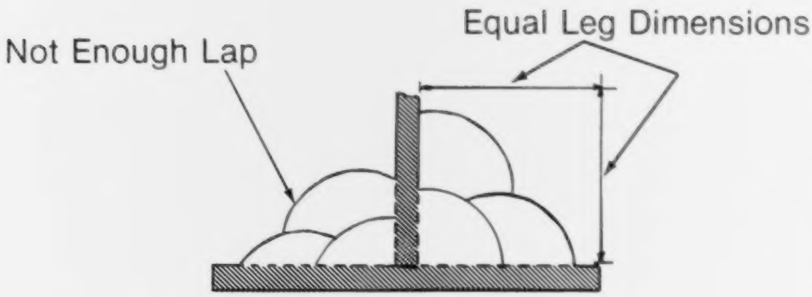
Correct and Incorrect Bead Laps


Proper Lap
1
2
3

End View


Too Much Lap
Not Enough Lap
1
2
3

End View


Not Enough Lap
Equal Leg Dimensions

Avoid this. **Do this.**

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

INFORMATION SHEET

I. Terms and definitions associated with position shielded metal-arc welding

A. Position welding — Welding done other than in the flat position

B. Shielded metal-arc welding (SMAW) — Joining of two or more pieces of metal by fusion

(NOTE: In arc welding, the heat to fuse the metal is produced by an electric arc.)

C. Fusion — Process of heating metal to a molten state and allowing it to cool

D. Base metal — Metal to be welded

E. Arc — Flow of current across a narrow gap, usually from tip of electrode to base metal

F. Arc length — Distance from end of electrode to point where arc makes contact with work surface

G. Electrode — Metal rod that conducts a current from electrode holder to base metal

(NOTE: The electrode melts and deposits metal in a bead.)

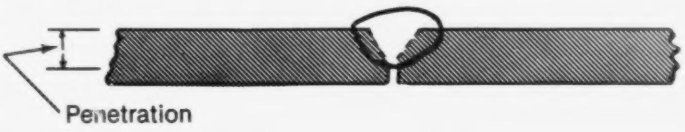
H. Flux — Coating on outside of electrode; chemical used to promote fusion during welding process

I. Spatter — Ball-type deposits of metal stuck to base metal along sides of bead

J. Penetration — Extent to which weld metal combines with base metal; measured from surface of base metal (Figure 1)

EXAMPLE:

FIGURE 1



K. Tack weld — Light weld used to hold base metals together

L. Coupon — Selected area cut from weld and adjacent base metal; used in testing weld quality

INFORMATION SHEET

   M. Polarity — Direction of flow of electric current in a direct-current welding machine

II. Abbreviations associated with position shielded metal-arc welding

   A. AC — Alternating current; electric current that reverses its direction at regular intervals

   B. AWS — American Welding Society

   C. DC — Direct current; electric current flowing in one direction only and mostly constant in value

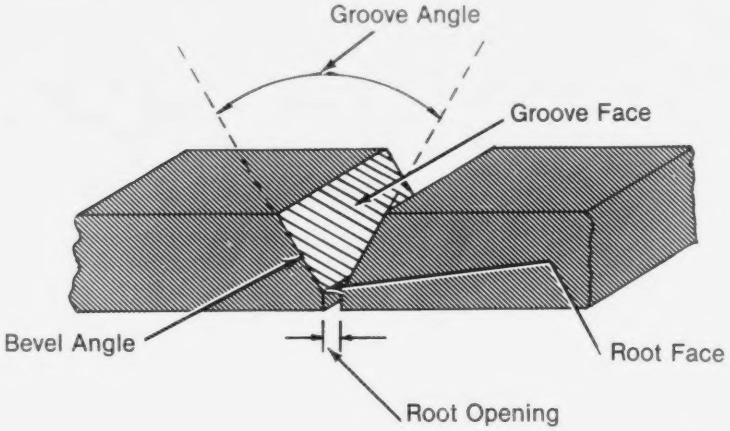
   D. OSHA — Occupational Safety and Health Act

   E. DCSP — Direct current straight polarity

   F. DCRP — Direct current reverse polarity

III. Parts of a plate joint (Figure 2)

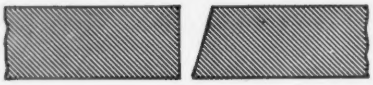
FIGURE 2



IV. Common groove weld joints (Figures 3-8)

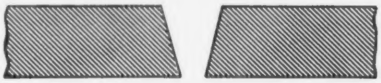
   A. Single-bevel groove

FIGURE 3



   B. Single-V groove

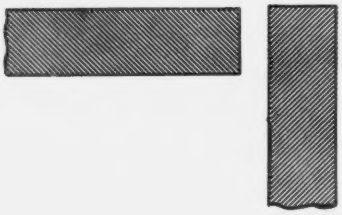
FIGURE 4



INFORMATION SHEET

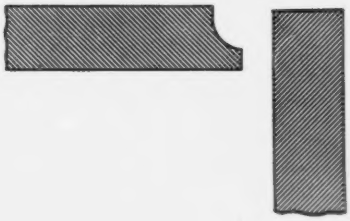
C. Square groove

FIGURE 5



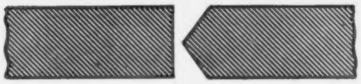
D. J-groove

FIGURE 6



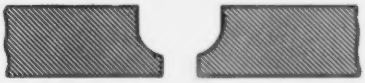
E. Double-bevel groove

FIGURE 7



F. U-groove

FIGURE 8

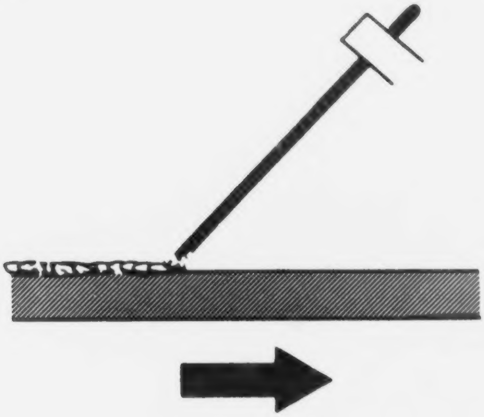


V. Welding positions (Figures 9-13)

A. Flat

(NOTE: In this position, welding is performed from the upper side of the joint, and the face of the weld is approximately horizontal.)

FIGURE 9



INFORMATION SHEET

B. Vertical

(NOTE: When welding in this position, the axis of the weld is approximately vertical.)

FIGURE 10: Vertical-down position

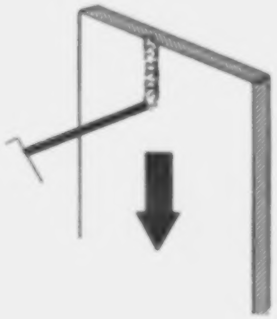
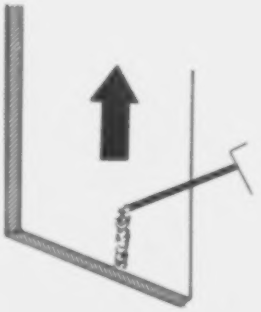


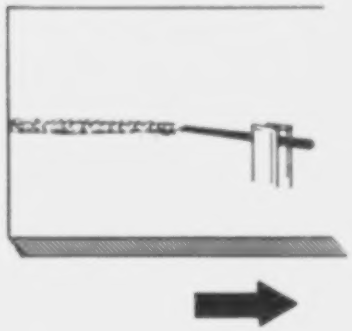
FIGURE 11: Vertical-up position



C. Horizontal

(NOTE: In this position, welding is performed on a horizontal joint, which is on a vertical surface [fillet weld], or where the axis of the weld lies in an approximate horizontal plane and the face of the weld lies in an approximate vertical plane [groove weld].)

FIGURE 12

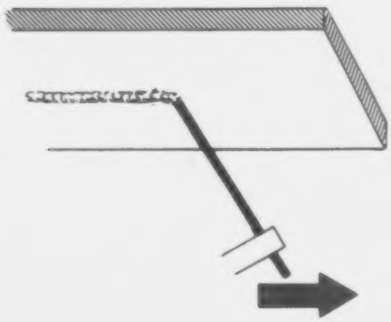


D. Overhead

(NOTE: In this position, welding is performed from the underside of the joint, and where the axis of the joint and base metal are approximately horizontal. See Figure 13.)

INFORMATION SHEET

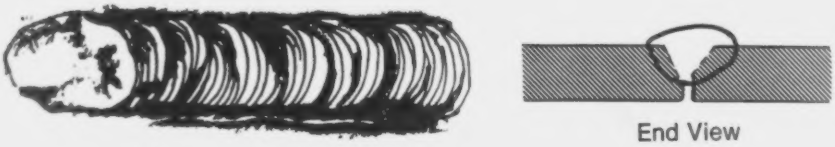
FIGURE 13



VI. Factors that determine a good weld (Figure 14)

EXAMPLE:

FIGURE 14: Surface appearance of a smooth, uniform, well-formed bead with good penetration and good fusion



A. Welding machine and circuit

(NOTE: You must properly adjust the welding machine and circuit so that the amperage is not set too high or too low for the welding job you are performing. For example, when welding a thick base metal, more heat is needed to obtain proper penetration; therefore, the welding machine must be adjusted to a higher setting.)

B. Electrode

(NOTE: You must choose an electrode that is the proper size, is made of the proper metal, and has the proper coating for the welding job you are performing.)

C. Arc length

(NOTE: You must strike an arc so that the arc length is neither too long nor too short. If the arc length is too short, the electrode sticks or welds itself into the base metal; if the arc length is too long, the voltage cannot maintain the arc and the arc will break [go out].)

INFORMATION SHEET

D. Electrode movement

(NOTE: You must hold the electrode at the proper angle and move the electrode in the proper pattern and at the proper speed for the type of joint, size of joint, and position of weld for the welding job you are performing.)

VII. Factors that determine proper setting for a welding machine

(NOTE: The items listed below should each be considered and used as a mental checklist before you set the welding machine for a particular welding job.)

A. Thickness of metal to be welded

(NOTE: When welding thicker metal, more heat is needed to obtain proper penetration; therefore, the welding machine must be adjusted to a higher setting.)

B. Diameter and type of electrode to be used

(NOTE: Increasing the size of the electrode causes more heat to be needed to melt the electrode, thereby requiring a higher machine setting.)

C. Welding technique to be used by operator

(NOTE: Different arc lengths and electrode-manipulation techniques require different machine settings.)

D. Position in which welding is to be performed

(NOTE: Different welding positions require different machine adjustments.)

E. Efficiency of welding machine

(NOTE: Welding machines have different efficiency ratings, which affect performance in particular welding situations.)

F. Polarity of machine

(NOTE: Different welding situations may require different polarity and machine adjustments.)

G. Length of welding cables

(NOTE: Increasing the length of the welding cables causes a corresponding drop in voltage, thereby requiring a higher machine setting.)

VIII. Common welding problems and their descriptions (Figures 15-22)

A. Inadequate penetration — Incomplete filling at root

INFORMATION SHEET

EXAMPLES:

FIGURE 15: Incomplete penetration due to misalignment of joint

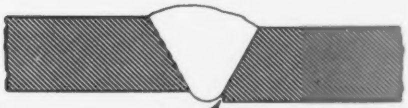
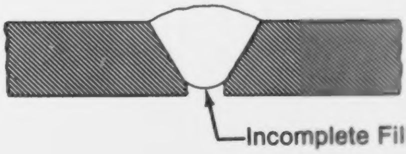

Incomplete Filling at
Root on One Side Only

FIGURE 16

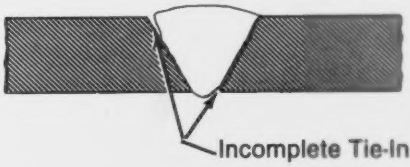

Incomplete Filling
at Root

Figures 15 and 16 used with permission of American Petroleum Institute.

B. Incomplete fusion — Incomplete tie-in at root or top of joint between weld-metal and base-metal surfaces

EXAMPLE:

FIGURE 17


Incomplete Tie-Ins

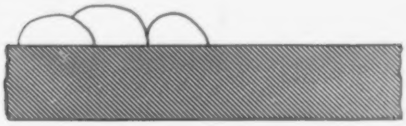
Used with permission of American Petroleum Institute.

C. Cold lap — Incomplete fusion between two adjacent weld beads or between a weld bead and the base-metal surface (See Figure 18)

INFORMATION SHEET

EXAMPLE:

FIGURE 18



D. Slag inclusion — Nonfused, nonmetallic solids in weld metal

E. Porosity — Gas pockets in weld metal

F. Undercutting — Groove melted into base metal adjacent to edge of weld and left unfilled by weld metal

EXAMPLES:

FIGURE 19

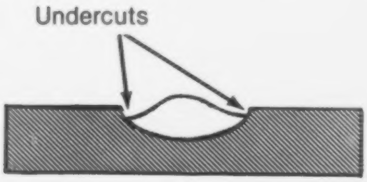
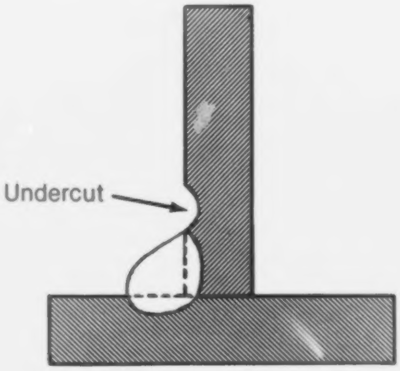


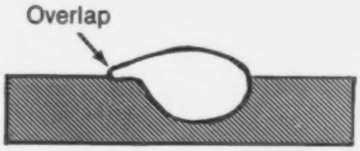
FIGURE 20



G. Overlap — Extension of weld face beyond edge of weld where fusion occurred

EXAMPLE:

FIGURE 21



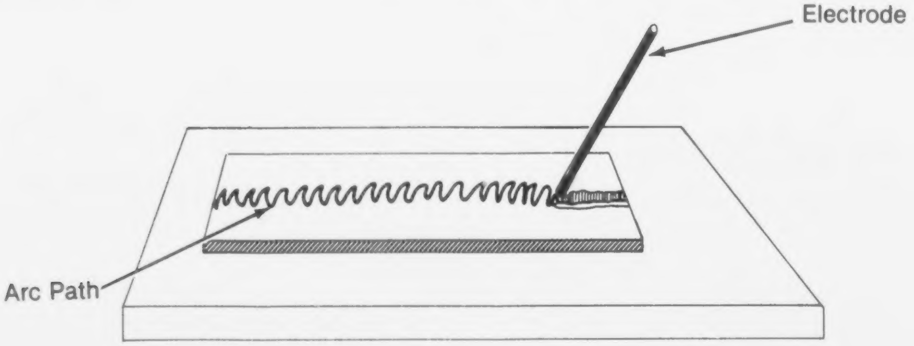
INFORMATION SHEET

H. Arc blow — Tendency for arc to wander or whip from its normal course

(NOTE: The arc normally extends straight out from the electrode and moves as an extension of the electrode as the electrode is manipulated by the operator. In arc blow, the arc seems to move about out of the operator's control.)

EXAMPLE:

FIGURE 22



IX. Causes of common welding problems (Table 1)

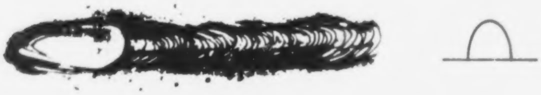
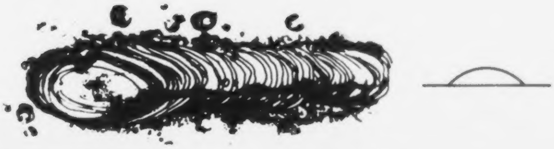
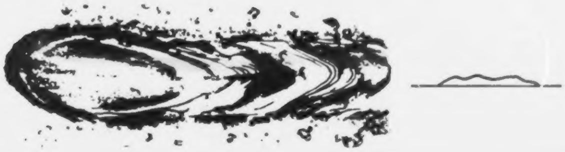
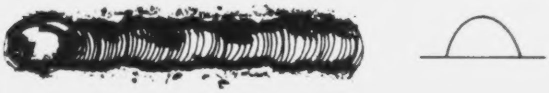
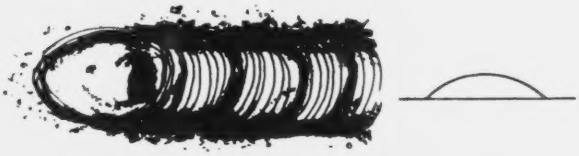
TABLE 1: Causes of common welding problems

Problem	Cause
Inadequate penetration	Joint misalignment; failure to completely fill weld with weld metal
Incomplete fusion	Failure to raise base metal to melting point
Cold lap	Improper starts; improper current adjustment
Slag inclusion	Rapidly solidifying slag; welding current too low; improper cleaning; nonmetallic elements from flux
Porosity	Chemical reactions taking place during welding; arc too long; wind or other atmospheric conditions
Undercutting	High amperage and long arc; incorrect electrode position; wrong travel speed; bad welding technique
Overlap	Bead made with insufficient heat
Arc blow	Forces in magnetic field built up around arc in DC arc welding

INFORMATION SHEET

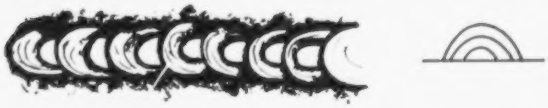
X. Causes of improperly formed beads (Table 2)

TABLE 2: Causes of improperly formed beads

Bead characteristics	Cause
Narrow bead with deposited metal piled high, resulting in poor penetration 	Current too low
Bead with excessive spatter, undercutting of weld joint 	Current too high
Flat bead with lack of uniformity on face, resulting in poor penetration 	Voltage too high
Wide, highly piled bead, resulting in poor penetration 	Voltage too low
Wide bead with excessive metal deposit 	Speed too slow, causing excessive heat

INFORMATION SHEET

TABLE 2 (Continued)

Bead characteristics	Cause
Bead with irregular width and height and insufficient metal deposit, causing poor penetration 	Speed too fast

XI. Techniques used when making multiple passes

A. Removing slag from beads

(NOTE: When multiple passes must be made, numerous beads must be tied together [fused]. Removing slag after each pass permits better fusion of beads by preventing gas pockets and slag inclusions, and it also improves the appearance of the bead. Grinding to create a smooth weld before painting will help give a high-quality appearance to a product that is to be sold.)

B. Lapping beads (fusing beads)

(NOTE: When multiple passes must be made, properly lapping beads increases the strength of the weld and improves penetration and the appearance of the weld. See Figures 23 through 25 for examples of properly and improperly lapped beads.)

FIGURE 23: Proper bead laps

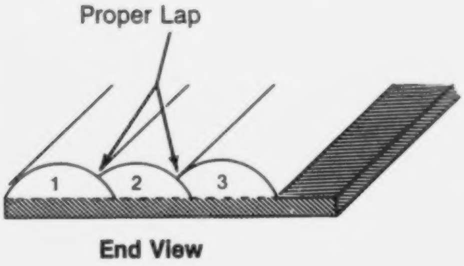
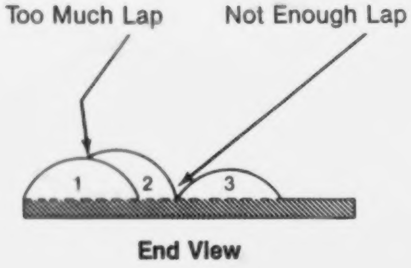
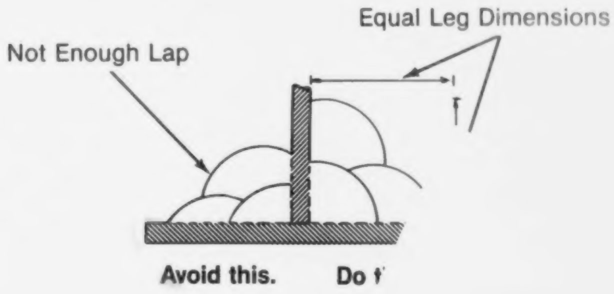


FIGURE 24: Improper bead laps



INFORMATION SHEET

FIGURE 25: Proper and improper lapping



XII. Methods of protection from arc-welding hazards

A. Radiation from the arc, ultraviolet and infared rays

1. Wear arc welder's helmet with approved lenses

(NOTE: Never look at an arc from any distance unless your eyes are protected by approved lenses. Acceptable lens shades for arc welding range from #9 to #14. The larger the number, the darker the lens will be.)

2. Wear gloves and clothing of sufficient weight to shut out rays from arc

(NOTE: Rays from arc welding produce burns that are comparable to sunburn if the skin is not protected.)

3. Protect others by shielding operation so that they cannot accidentally look directly at arc or have it shine in their eyes

B. Flying sparks and globules of molten metal

1. Wear clothing that is not flammable, and remove flammable materials from pockets

2. Wear cuffless trousers, and cover pockets so that they will not collect sparks and globules

3. Wear high shoes with safety toes

C. Electric shock

1. Work on a dry floor

2. Use insulated electrode holders

3. Wear dry welding gloves

INFORMATION SHEET

D. Fumes — Use proper ventilating equipment

(NOTE: The fumes generated in the welding arc may contain poisonous metal oxides. Never do arc welding in an area that is not well ventilated, and always use specially ventilated welding helmets when necessary. This is especially important when welding galvanized metal.)

E. Burns

1. Use leather welding gloves
2. Wear apron made of leather or heavy, tightly woven cotton
3. Handle hot metal with tongs or pliers

   (NOTE: Do not pick up hot metal with your gloves. The hot metal hardens the leather and ruins the gloves.)

4. Cool metal in quenching tank before handling with hands

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

ASSIGNMENT SHEET #1 — ANALYZE POOR WELDS

NAME ______________________________ SCORE ______________

When welding you will be required to produce a quality weld in many different welding situations. Many times, one welding situation may seem similar to one you have experienced previously, but you are still not able to produce a quality weld. Then you must be able to examine a weld and determine the problem, determine the cause of the problem, and know how to correct the problem to finally produce a good weld.

Study the Information Sheet, Sections VIII through X until you are familiar with the factors that can influence weld quality. Also study Table 3 at the end of this assignment sheet to learn possible corrective procedures for common welding problems. Then your instructor will provide you with five samples of poor welds. Analyze each sample, and in the following blanks, list the problem, the probable cause of the problem, and one corrective procedure to take to achieve a quality weld.

A. Sample #1

Problem — ______________________________

Probable cause — ______________________________

Corrective procedure — ______________________________

B. Sample #2

Problem — ______________________________

Probable cause — ______________________________

Corrective procedure — ______________________________

C. Sample #3

Problem — ______________________________

Probable cause — ______________________________

Corrective procedure — ______________________________

ASSIGNMENT SHEET #1

D. Sample #4

Problem — ____________________

Probable cause — ____________________

Corrective procedure — ____________________

E. Sample #5

Problem — ____________________

Probable cause — ____________________

Corrective procedure — ____________________

ASSIGNMENT SHEET #1

TABLE 3: Possible corrective procedures for common welding problems

Problem	Possible corrective procedures
Inadequate penetration	Change electrode manipulation pattern; increase amperage; slow rate of travel
Incomplete fusion	Check joint preparation and fit-up; check root gap and root face; use smaller electrode; use higher welding current; slow travel speed; change electrode manipulation pattern
Cold lap	Check for proper amperage; check welding technique
Slag inclusion	Clean welds thoroughly between passes; increase amperage; check welding technique; correct joint contours by grinding; check joint penetration and fit-up
Porosity	Check for proper amperage; reduce arc length; check dryness of electrode
Undercutting	Reduce amperage and arc length; correct electrode angle; adjust travel speed
Overlap	Increase amperage and change electrode manipulation technique
Arc blow	Carefully clamp work to welding table in several places; reduce current; switch polarity; change location of ground clamp; maintain a short arc; if possible, wrap ground cable around workpiece and pass ground current through workpiece to neutralize magnetic field

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

ANSWERS TO ASSIGNMENT SHEET

Assignment Sheet #1 — Evaluated to the satisfaction of the instructor

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

JOB SHEET #1 — MAKE A PAD IN THE HORIZONTAL POSITION

I. Equipment and materials

- A. Arc-welding station and required tools
- B. Leather gloves
- C. Welding helmet with proper lens shade
- D. Protective clothing
- E. Chipping goggles
- F. Safety glasses
- G. Wire brush
- H. Chipping hammer
- I. E-6010, 6011, or 6013 electrode, 1/8 inch or 5/32 inch
  - 1. 1/8 inch — 75 to 130 amps
  - 2. 5/32 inch — 90 to 175 amps
- J. AC current
- K. Mild-steel plate, 6 inches square, 3/8 inch thick

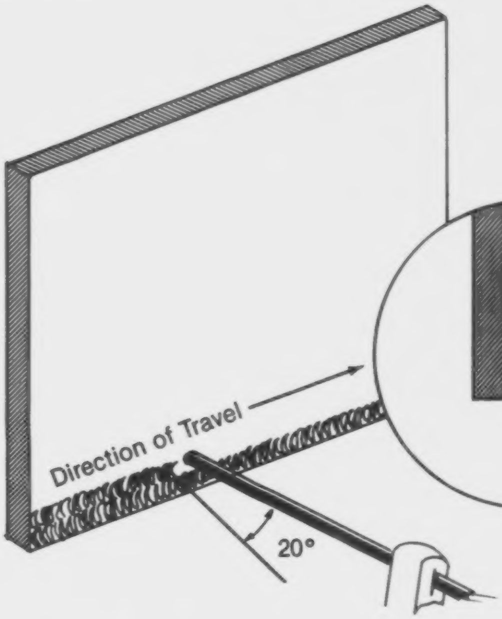
II. Procedure

(NOTE: When not wearing other types of eye protection, always wear safety glasses in the shop.)

- A. Adjust welding machine to correct current and amperage settings
- B. Put on welding helmet
- C. Position metal in horizontal position; clamp or tack weld in place
- D. Position electrode down 5 to 10 degrees from horizontal and then angle 20 degrees in direction of travel (See Figure 26)

JOB SHEET #1

FIGURE 26



E. Strike arc and hold high arc length one to two seconds in one lower corner to heat plates

F. Run a bead, welding to the other lower corner, holding center of bead 1/8 to 3/16 inch from bottom edge, and using rod manipulation determined by instructor

(NOTE: Hold center of bead 1/8 to 3/16 inch from bottom edge to avoid burning off edge.)

G. Remove welding helmet and put on chipping goggles

H. Chip slag and brush weld clean

(NOTE: Cleaning bead thoroughly before making next pass helps ensure a sound weld with proper penetration and fusion.)

I. Remove chipping goggles

J. Check weld surface for pinholes and slag inclusions and make sure that crater at end of bead is filled

K. Adjust welding machine, circuit, and speed of travel as necessary

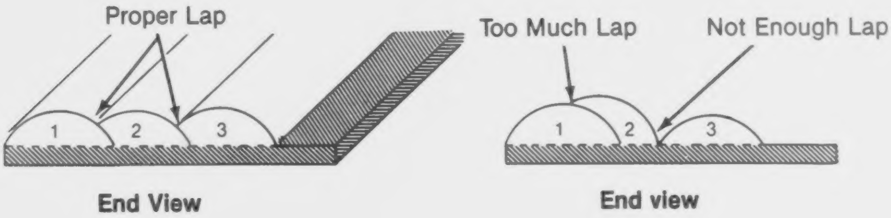
JOB SHEET #1

L. Put on welding helmet

M. Follow procedures in steps D through K for second bead, but also lap the first one-third of the previous bead (See Figure 27)

N. Continue running beads, lapping beads, and cleaning beads before each pass until pad is full (Figure 27)

FIGURE 27


Proper Lap
1
2
3
End View
Too Much Lap
Not Enough Lap
1
2
3
End view

O. Remove welding helmet

P. Clean pad and turn it in to your instructor for evaluation

Q. Clean work area and store equipment and materials properly

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

JOB SHEET #2 — MAKE A SINGLE-V-GROOVE BUTT WELD IN THE HORIZONTAL POSITION

I. Equipment and materials

   A. Arc-welding station and required tools

   B. Leather gloves

   C. Welding helmet with proper lens shade

   D. Protective clothing

   E. Chipping goggles

   F. Wire brush

   G. Chipping hammer

   H. Safety glasses

   I. Two 5″ × 6″ mild-steel plates, 3/8 inch thick

   J. E-6010, 6011, or 6013 electrode, 1/8 inch or 5/32 inch

      1. 1/8 inch — 75 to 130 amps

      2. 5/32 inch — 90 to 175 amps

   K. AC current

   L. Grinder or cutting torch and proper eye protection

II. Procedure

(NOTE: When not wearing other types of eye protection, always wear safety glasses in the shop.)

   A. Adjust welding machine for correct current and amperage settings

   B. Prepare plates for welding

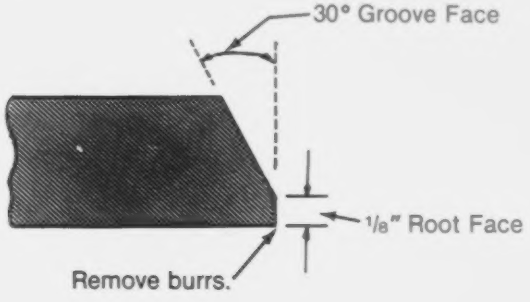
      1. Put on eye protection for grinding or flame-cutting

      2. Grind or flame-cut one end of each plate to a groove face with a 30-degree angle and 1/8-inch root face (See Figure 28)

JOB SHEET #2

3. Grind off burrs on backs of plates (Figure 28)

FIGURE 28


30° Groove Face
1/8" Root Face
Remove burrs.

4. Grind off all burrs and slag if flame-cut

5. Remove eye protection

C. Put on welding helmet

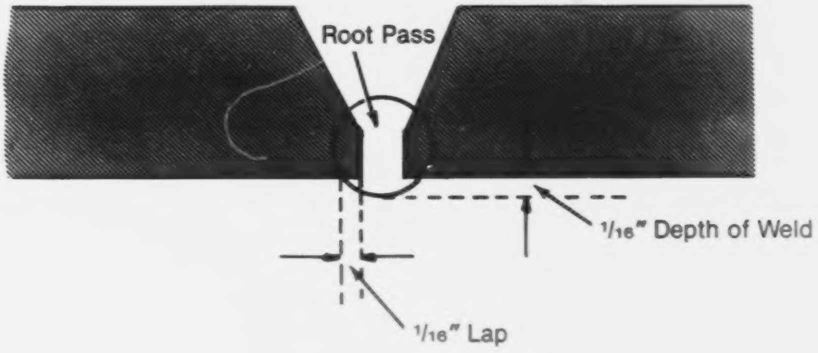
D. Tack-weld plates together, leaving a root gap of 3/32 to 1/8 inch

E. Place tacked plates in a horizontal position with V-groove facing you

F. Strike arc and, using rod-manipulation method determined by instructor, run root pass so that there is 100 percent penetration through root and laps of 1/16 inch on each side (Figure 29)

(NOTE: The back of the root pass should have a convex appearance when observed from the bottom of the plate. See Figure 29.)

FIGURE 29


Root Pass
1/16" Depth of Weld
1/16" Lap

JOB SHEET #2

G. Remove welding helmet and put on chipping goggles

H. Chip slag and brush weld clean

I. Remove chipping goggles and put on welding helmet

J. Deposit additional welds to fill joint, using stringers or weaves determined by instructor; brush weld clean after each pass

K. Make cover pass (or passes) so that it is slightly convex and laps top edge of groove $^{1}/_{16}$ inch on each side

L. Remove welding helmet

M. Cut and prepare coupons, using method determined by instructor

N. Cool plate slowly in still air

> **CAUTION**
>
> Do not cool in water.

O. Test coupons, using method determined by instructor

P. Clean work area and store equipment and materials properly

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

JOB SHEET #3 — MAKE A SINGLE-V-GROOVE BUTT WELD IN THE VERTICAL-UP POSITION

I. Equipment and materials

- A. Arc-welding station and required tools
- B. Two 5" × 6" mild-steel plates, 3/8 inch thick
- C. Leather gloves
- D. Protective clothing
- E. Chipping goggles
- F. Wire brush
- G. Chipping hammer
- H. Safety glasses
- I. Welding helmet with proper lens shade
- J. 3/32- to 1/8-inch wire spacer
- K. E-6010, 6011, or 6013 electrode, 1/8 inch or 5/32 inch
  1. 1/8 inch — 75 to 130 amps
  2. 5/32 inch — 90 to 175 amps
- L. AC current
- M. Grinder or cutting torch and proper eye protection

II. Procedure

(NOTE: When not wearing other types of eye protection, always wear safety glasses in the shop.)

- A. Adjust welding machine for correct current and amperage settings

  (NOTE: Vertical-up position requires less amperage than flat and horizontal welding.)

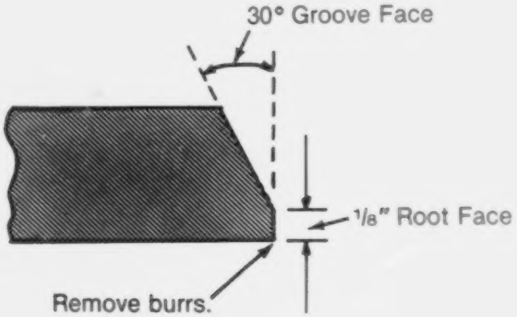
- B. Prepare plates for welding
  1. Put on eye protection for grinding or flame-cutting

JOB SHEET #3

2. Grind or flame-cut one end of each plate to a groove face with a 30-degree angle and a 1/8-inch root face (See Figure 30)

3. Grind off burrs on backs of plates (Figure 30)

FIGURE 30


30° Groove Face
1/8" Root Face
Remove burrs.

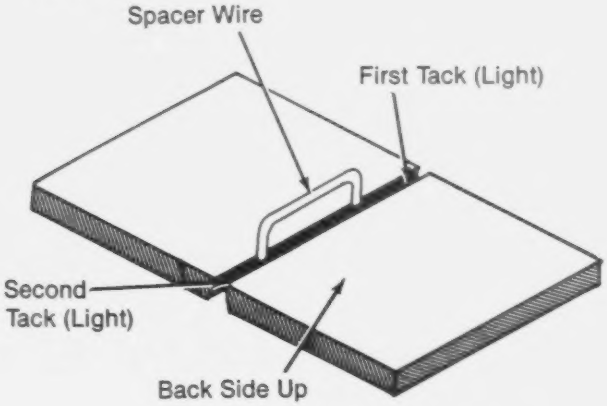
4. Grind off all burrs and slag if flame-cut

5. Remove eye protection

C. Put on welding helmet

D. Turn plates back side up and, using a U-shaped wire spacer to maintain root gap of from 3/32 to 1/8 inch, lightly tack-weld backs of plates at one end and then at opposite end (Figure 31)

FIGURE 31

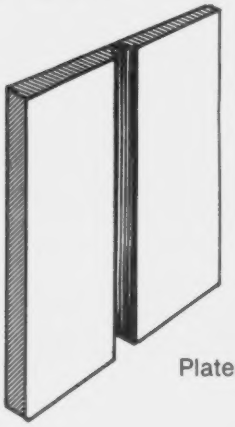

Spacer Wire
First Tack (Light)
Second Tack (Light)
Back Side Up

Joint spacing should be equal from one end to the other.

JOB SHEET #3

E. Place plate in vertical position (Figure 32)

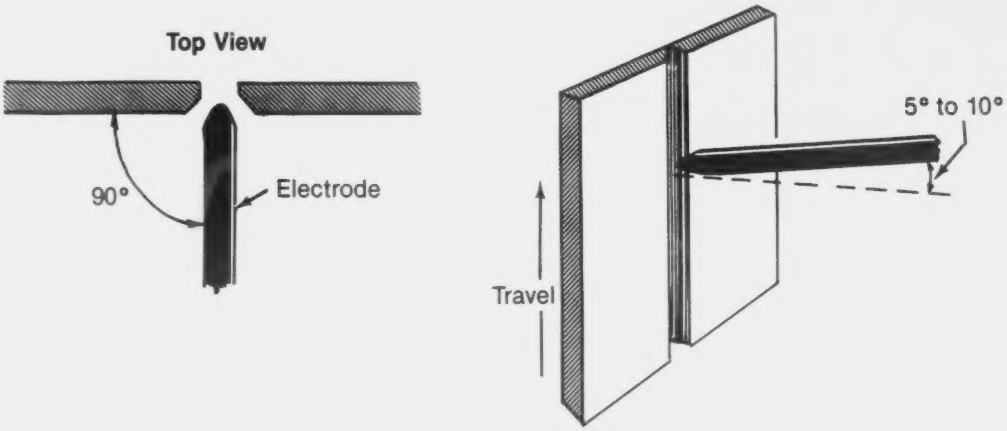
FIGURE 32



Plates Vertical, Axis of Weld Vertical

F. Position electrode at 90 degrees into joint (straight into joint) and then angle 5 to 10 degrees up from horizontal (Figure 33)

FIGURE 33



G. Strike arc and hold high arc one to two seconds to heat plate

H. Move to bottom of plate and, using rod manipulation method determined by instructor, begin running root pass, forming a keyhole in front of weld puddle as large as electrode diameter

(NOTE: Form keyhole in front of weld puddle to ensure good fusion to root of joint.)

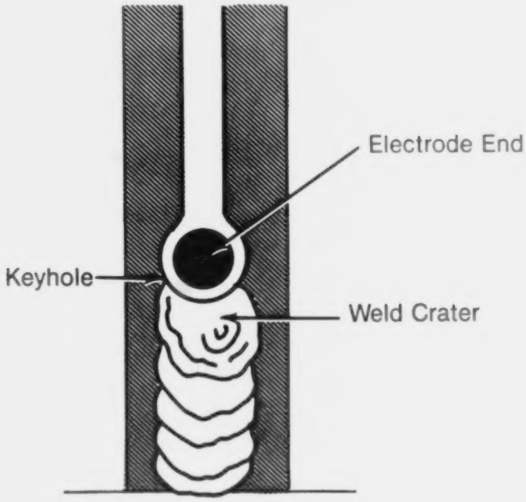
JOB SHEET #3

I. Method for stopping and restriking arc

(NOTE: If you must break the arc before the completion of the bead, use this method.)

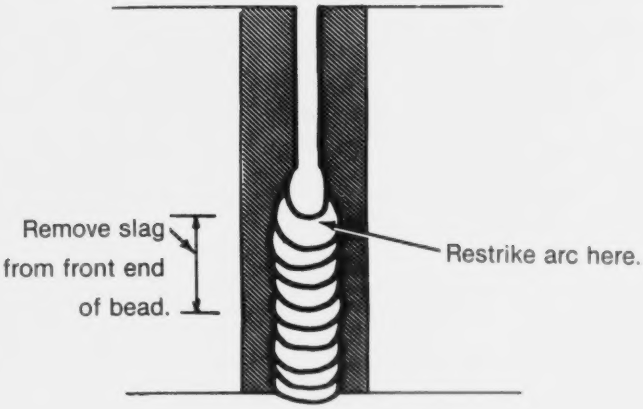
1. To stop weld, melt out keyhole as large as electrode diameter in center of weld (Figure 34)

FIGURE 34


Electrode End
Keyhole
Weld Crater

2. Remove slag from end of bead (See Figure 35)
3. To restart weld, restrike arc below keyhole and complete bead (Figure 35)

FIGURE 35

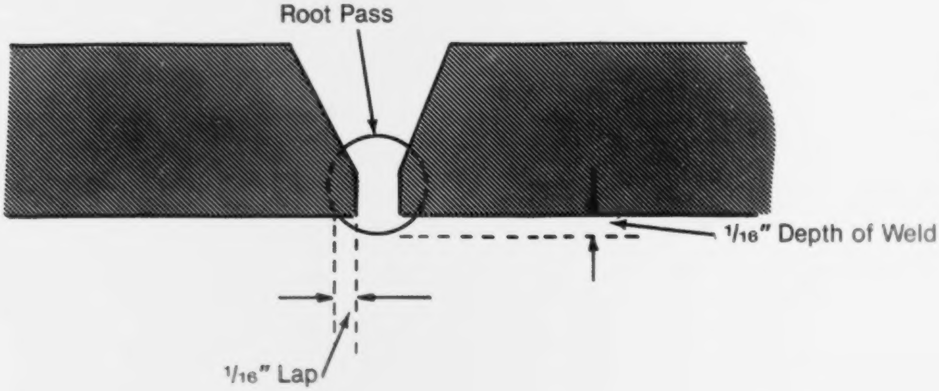

Remove slag
from front end
of bead.
Restrike arc here.

JOB SHEET #3

J. Inspect root pass

(NOTE: The root pass should have 100 percent penetration through the root, laps of 1/16 inch on each side, and a crater filled to about 3/16 inch bead width. Also, the back of the root pass should have a convex appearance when observed from the bottom of the plate. See Figure 36.)

FIGURE 36



K. Remove welding helmet and put on chipping goggles

L. Chip slag and brush weld clean

M. Remove chipping goggles and put on welding helmet

N. Deposit additional welds to fill joint, using weaves or stringers and following procedures in steps H and I; brush weld clean after each pass

O. Make cover pass (or passes) so that it is slightly convex and laps top edge of groove 1/16 inch on each side

P. Remove welding helmet

Q. Cut and prepare coupons, using method determined by instructor

R. Cool plate slowly in still air

CAUTION

Do not cool in water.

S. Test coupons, using method determined by instructor

T. Clean work area and store equipment and materials properly

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

JOB SHEET #4 — MAKE A SINGLE-V-GROOVE BUTT WELD IN THE OVERHEAD POSITION

I. Equipment and materials

- A. Arc-welding station and required tools
- B. Leather gloves
- C. Welding helmet with proper lens shade
- D. Protective clothing
- E. Chipping goggles
- F. Chipping hammer
- G. Safety glasses
- H. Wire brush
- I. Two 5″ × 6″ mild-steel plates, 3/8 inch thick
- J. 3/32- to 1/8-inch wire spacer
- K. E-6010, 6011, or 6013 electrode, 1/8 inch or 5/32 inch
  1. 1/8 inch — 75 to 130 amps
  2. 5/32 inch — 90 to 175 amps
- L. AC current
- M. Grinder or cutting torch and proper eye protection

II. Procedure

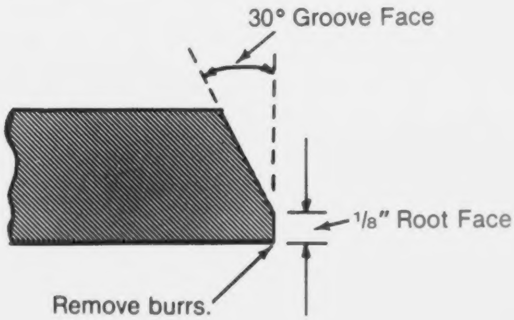
(NOTE: When not wearing other types of eye protection, always wear safety glasses in the shop.)

- A. Adjust welding machine for correct current and amperage settings
- B. Prepare plates for welding
  1. Put on eye protection for grinding or flame-cutting
  2. Grind or flame-cut one end of each plate to a groove face with a 30-degree angle and a 1/8-inch root face (See Figure 37)

JOB SHEET #4

3. Grind off burrs on backs of plates (Figure 37)

FIGURE 37


30° Groove Face
1/8" Root Face
Remove burrs.

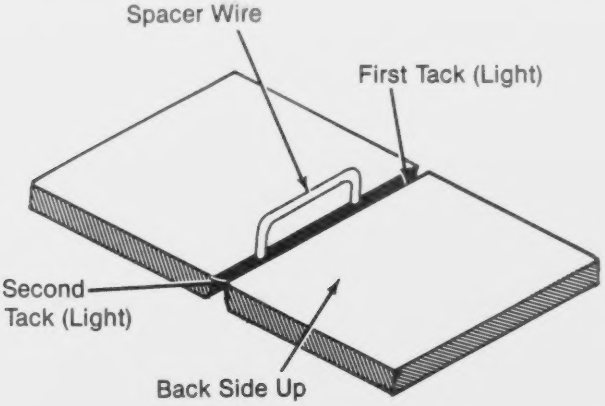
4. Grind off all burrs and slag if flame-cut

5. Remove eye protection

C. Put on welding helmet

D. Turn plates back side up and, using a U-shaped wire spacer to maintain root gap of from 3/32 to 1/8 inch, lightly tack-weld backs of plates at one end and then at opposite end (Figure 38)

FIGURE 38


Spacer Wire
First Tack (Light)
Second Tack (Light)
Back Side Up

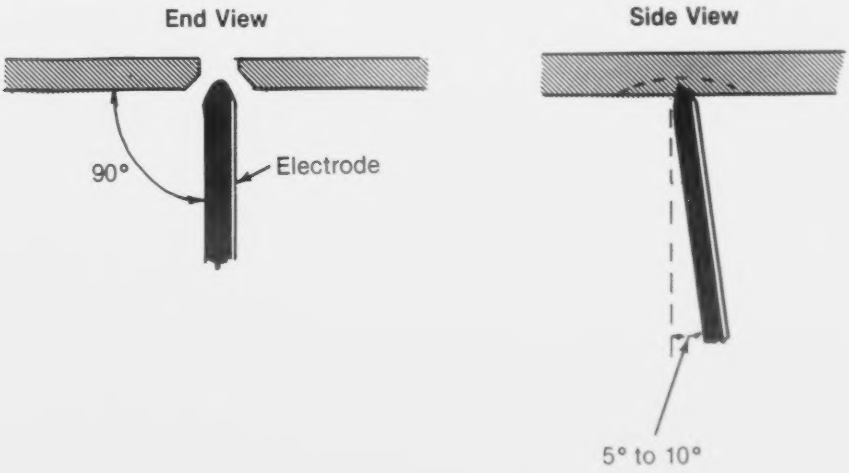
Joint spacing should be equal from one end to the other.

E. Place plates in overhead position

JOB SHEET #4

F. Position electrode straight into joint vertically and then angle 5 to 10 degrees in direction of travel (Figure 39)

FIGURE 39


End View
90°
Electrode
Side View
5° to 10°

G. Strike arc and hold high arc one to two seconds to heat plate

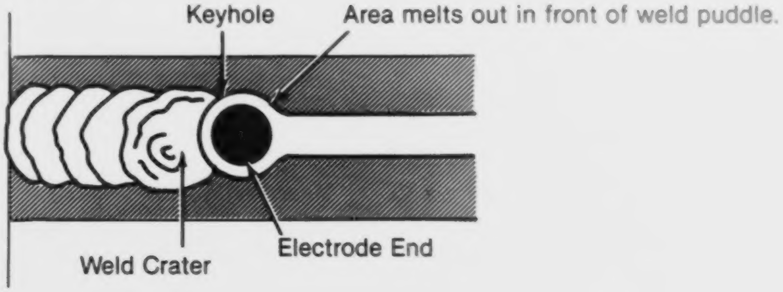
H. Move to end of plate and, using rod-manipulation method determined by instructor, begin running root pass

(NOTE: In overhead position, you will need to move the electrode in and out of the puddle more frequently and hold it out of the puddle for slightly longer periods of time to keep the molten metal from dropping out of the weld.)

I. Holding a short arc length, position end of electrode halfway into root gap, forming a keyhole in front of weld puddle as large as electrode diameter (Figure 40)

(NOTE: Form a keyhole in front of the weld puddle to ensure good fusion to root of joint.)

FIGURE 40


Keyhole
Area melts out in front of weld puddle.
Electrode End
Weld Crater

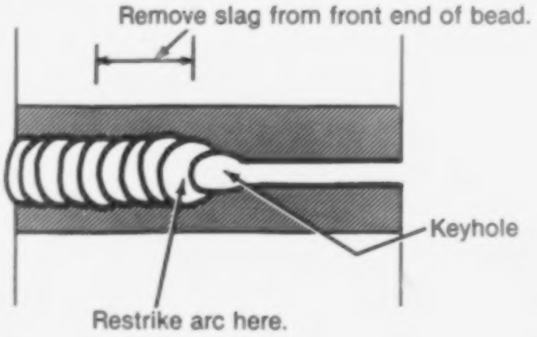
JOB SHEET #4

J. Method for stopping and restriking arc

(NOTE: If you must break the arc before the completion of the bead, use this method.)

1. To stop weld, melt out keyhole in center of weld (See Figure 41)
2. Remove slag from end of bead (See Figure 41)
3. To restart weld, restrike arc below keyhole and complete bead (Figure 41)

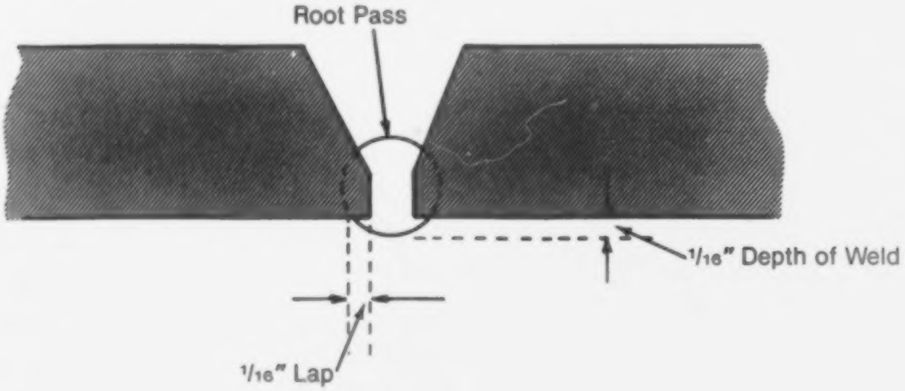
FIGURE 41


Remove slag from front end of bead.
Keyhole
Restrike arc here.

K. Inspect root pass

(NOTE: The root pass should have 100 percent penetration through the root, laps of $^1/_{16}$ inch on each side, and a crater filled to about $^3/_{16}$ inch bead width. Also the back of the root should have a convex appearance when observed from the bottom of the plate. See Figure 42.)

FIGURE 42


Root Pass
1/16" Depth of Weld
1/16" Lap

JOB SHEET #4

L. Remove welding helmet and put on chipping goggles

M. Chip slag and brush weld clean

N. Remove chipping goggles and put on welding helmet

O. Deposit additional welds to fill joint, using weaves or stringers and following procedures in steps H and I; brush weld clean after each pass

P. Make cover pass (or passes) so that it is slightly convex and laps top edge of groove $^1/_{16}$ inch on each side

Q. Remove welding helmet

R. Cut and prepare coupons, using method determined by instructor

S. Cool plate slowly in still air

CAUTION

Do not cool in water.

T. Test coupons, using method determined by instructor

U. Clean work area and store equipment and materials properly

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

JOB SHEET #5 — MAKE A T-JOINT FILLET WELD IN THE VERTICAL-UP POSITION

I. Equipment and materials

A. Arc-welding station and required tools

B. Leather gloves

C. Welding helmet with proper lens shade

D. Protective clothing

E. Chipping goggles

F. Wire brush

G. Chipping hammer

H. Safety glasses

I. Two 2" × 6" mild-steel plates, 1/4 inch to 3/8 inch thick

J. E-6010, 6011, or 6013 electrode, 1/8 inch or 5/32 inch

  1. 1/8 inch — 75 to 130 amps

  2. 5/32 inch — 90 to 175 amps

K. AC current

II. Procedure

(NOTE: When not wearing other types of eye protection, always wear safety glasses in the shop.)

A. Adjust welding machine to correct current and amperage setting

B. Put on welding helmet

C. Prepare and tack metal to form a "T"

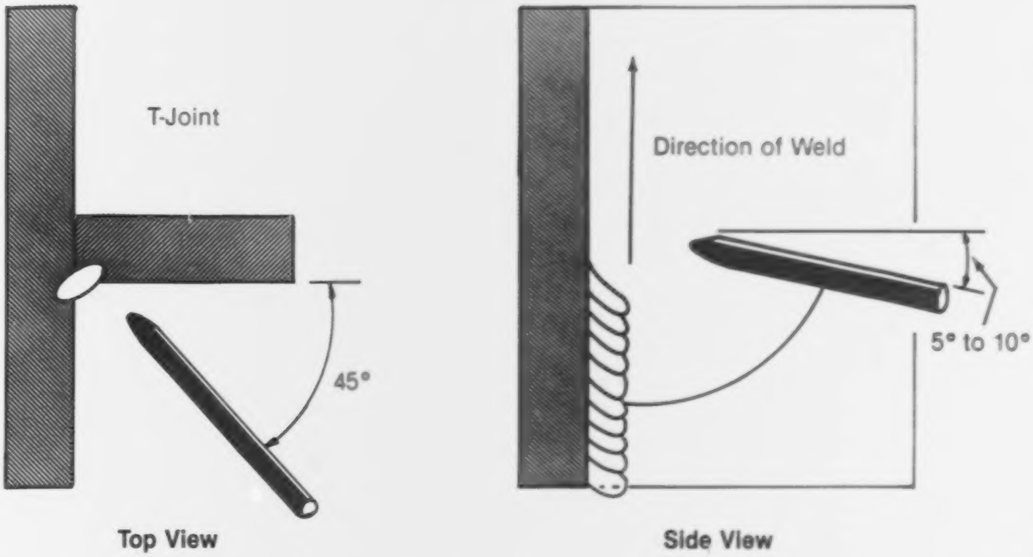
D. Position tacked plates as shown in Figure 43

E. Strike arc at bottom of joint and hold a high arc length for one to two seconds to heat plates

F. Position electrode in middle of joint at a 45-degree angle with each plate and then angle 5 to 10 degrees down from horizontal (See Figure 43)

JOB SHEET #5

FIGURE 43: Electrode position of vertical-up T-joint



G. Deposit weld upward, using some form of up-and-down whipping motion

(NOTE: Bead uniformity depends upon proper timing and maniupulation of the electrode. Check with your instructor for correct procedures.)

H. Remove welding helmet and put on chipping goggles

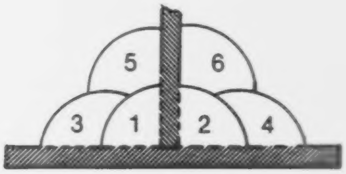
I. Chip slag and brush weld clean

J. Remove chipping goggles and put on welding helmet

K. Deposit additional welds, alternating sides to minimize distortion, and brushing weld clean after each pass (Figure 44)

(NOTE: Check with instructor at this point. Upon receiving instructor's approval, additional beads may be stringers or some form of weave bead.)

FIGURE 44: Alternating beads to minimize distortion



JOB SHEET #5

L. Complete exercise

M. Remove welding helmet

N. Turn plate in to instructor for evaluation

O. Clean work area and store equipment and materials properly

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

JOB SHEET #6 — MAKE A SQUARE-GROOVE BUTT-JOINT WELD IN THE VERTICAL-DOWN POSITION

I. Equipment and materials

A. Arc-welding station and required tools

B. Leather gloves

C. Welding helmet with proper lens shade

D. Protective clothing

E. Chipping goggles

F. Wire brush

G. Chipping hammer

H. Safety glasses

I. Two 3" × 6" mild-steel plates, 1/8 to 3/16 inch thick

J. E-6010, 6011, or 6013 electrode, 1/8 to 5/32 inch

1. 1/8 inch — 75 to 130 amps

2. 5/32 inch — 90 to 175 amps

K. AC current

II. Procedure

(NOTE: When not wearing other types of eye protection, always wear safety glasses in the shop.)

A. Adjust welding machine to correct current and amperage setting

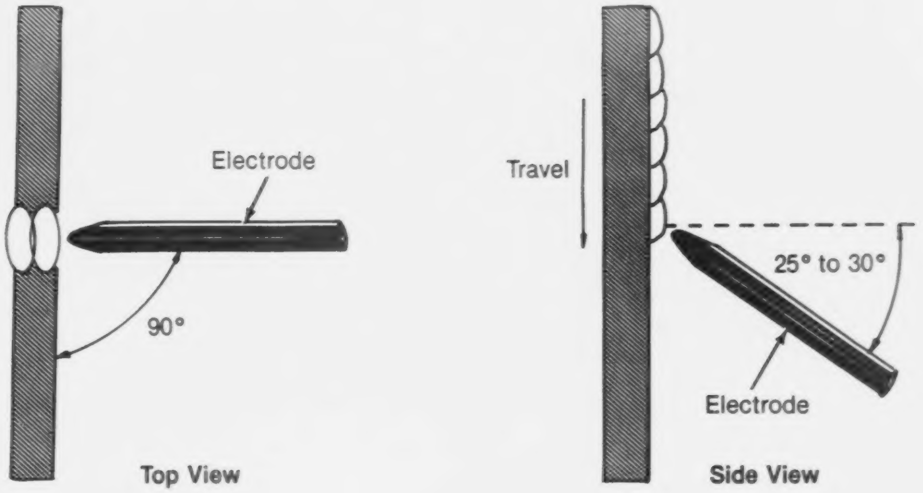
B. Put on welding helmet

C. Prepare and tack metal, leaving 1/16- to 1/8-inch root gap; position plates as shown in Figure 45

D. Position electrode straight into middle of joint and then angle down 25 to 30 degrees from horizontal (See Figure 45)

JOB SHEET #6

FIGURE 45



E. Strike arc at top of plates and hold high arc length for one to two seconds to heat plates

F. Holding a short arc length, weld down, using some form of whipping motion

(NOTE: Bead uniformity depends upon proper timing and manipulation of the electrode. Check with your instructor for correct procedures.)

G. Remove welding helmet and put on chipping goggles

H. Remove all slag from face and root; inspect bead thoroughly for penetration and even fusion with both plates

I. Remove chipping goggles and put on welding helmet

J. Starting at top of reverse side, run second bead, using same technique as for first pass

K. Remove welding helmet and put on chipping goggles

L. Clean and inspect weld

M. Remove chipping goggles

N. Turn plate in to instructor for evaluation

O. Clean work area and store equipment and materials properly

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

TEST

NAME ________________________________ SCORE ______________

1. Match to their correct definitions terms associated with position shielded metal-arc welding. Write the correct numbers in the blanks.

_____a. Welding done other than in the flat position

_____b. Extent to which weld metal combines with base metal; measured from surface of base metal

_____c. Metal rod that conducts a current from electrode holder to base metal

_____d. Coating on outside of electrode; chemical used to promote fusion during welding process

_____e. Process of heating metal to a molten state and allowing it to cool

_____f. Joining of two or more pieces of metal by fusion

_____g. Ball-type deposits of metal stuck to base metal along sides of bead

_____h. Flow of current across a narrow gap, usually from tip of electrode to base metal

_____i. Distance from end of electrode to point where arc makes contact with work surface

_____j. Selected area cut from weld and adjacent base metal; used in testing weld quality

_____k. Direction of flow of electric current in a direct-current welding machine

_____l. Metal to be welded

_____m. Light weld used to hold base metals together

1. Position welding
2. Shielded metal-arc welding (SMAW)
3. Fusion
4. Arc
5. Arc length
6. Electrode
7. Flux
8. Spatter
9. Penetration
10. Coupon
11. Polarity
12. Tack weld
13. Base metal

TEST

2. Match to their correct definitions abbreviations associated with position shielded metal-arc welding. Write the correct numbers in the blanks.

_____a. Occupational Safety and Health Act

_____b. American Welding Society

_____c. Direct current; electric current flowing in one direction only and mostly constant in value

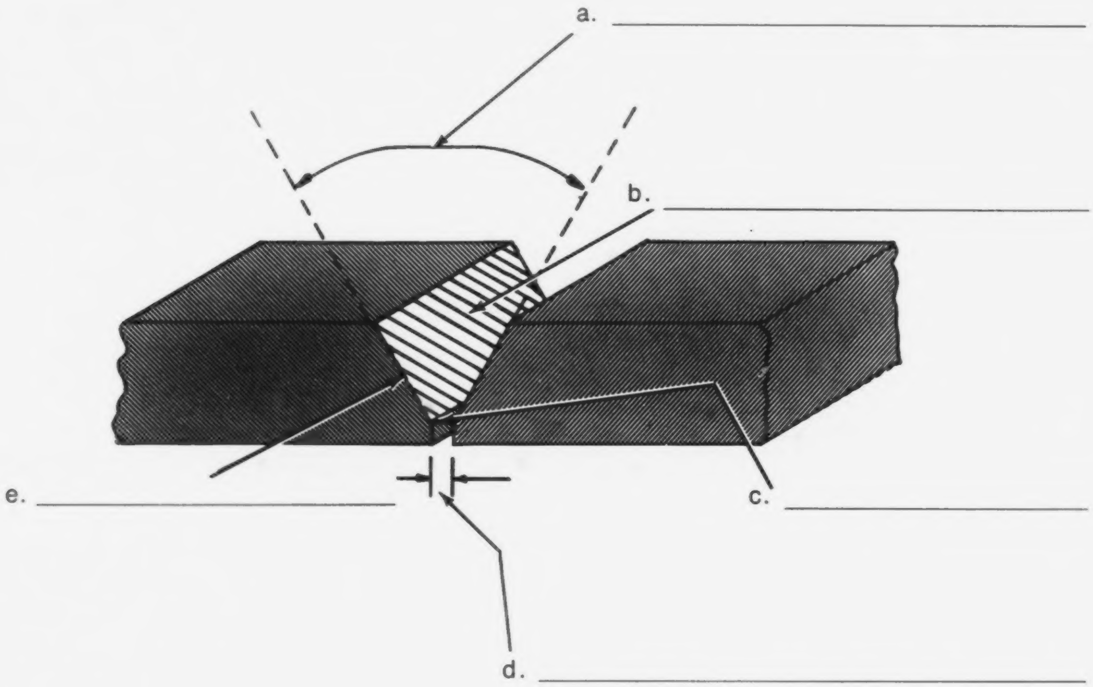
_____d. Alternating current; electric current that reverses its direction at regular intervals

_____e. Direct current reverse polarity

_____f. Direct current straight polarity

1. AC
2. AWS
3. DC
4. OSHA
5. DCSP
6. DCRP

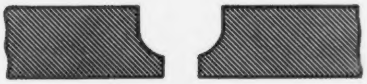
3. Label the parts of the plate joint illustrated below.

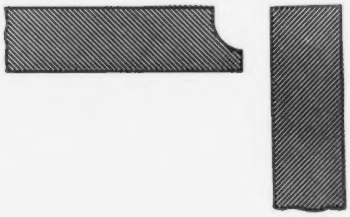


TEST

4. Identify common groove weld joints. Write the correct names in the blanks.

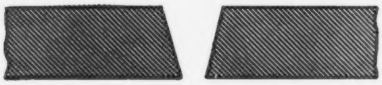
Square groove
J-groove
U-groove
Single-bevel groove
Single-V groove
Double-bevel groove

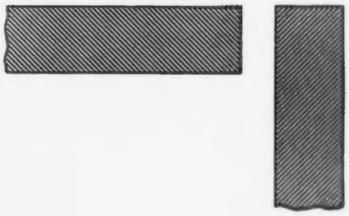




a. ____________________

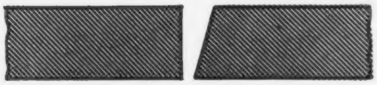
b. ____________________

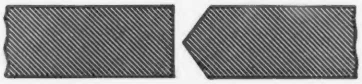




c. ____________________

d. ____________________





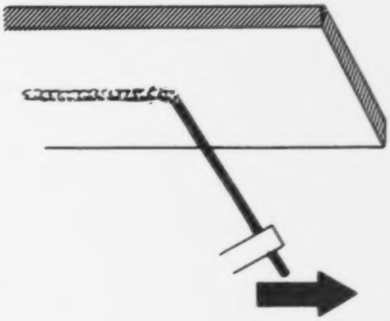
e. ____________________

f. ____________________

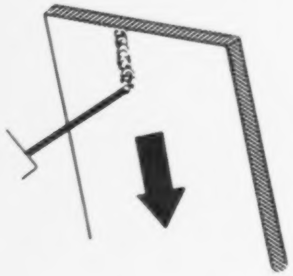
TEST

5. Identify welding positions. Write the correct names in the blanks.

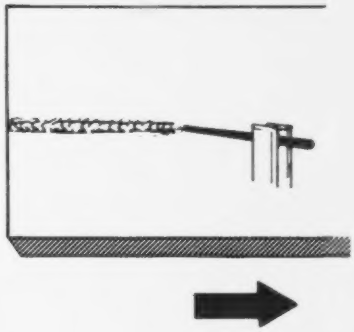
Flat
Horizontal
Vertical
Overhead



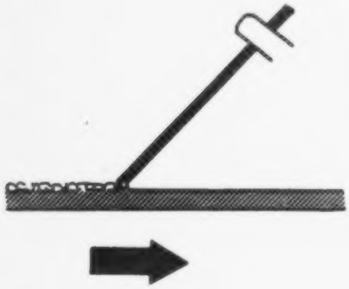
a. ______________________



b. ______________________



c. ______________________



d. ______________________

6. List factors that determine a good weld.

a. ______________________

b. ______________________

c. ______________________

d. ______________________

TEST

7. Select from the following list factors that determine proper setting for a welding machine. Write an "X" in the blank before each correct answer.

_____a. Polarity of machine

_____b. Size of ground clamp

_____c. Position in which welding is to be performed

_____d. Efficiency of welding machine

_____e. Thickness of metal to be welded

_____f. Shade of lens in welding helmet

_____g. Length of welding cables

_____h. Diameter and type of electrode to be used

_____i. Amount of slag desired

_____j. Welding technique to be used by operator

_____k. Condition of welding-cable insulation

8. Match common welding problems to their correct descriptions. Write the correct numbers in the blanks.

_____a. Incomplete filling at root

_____b. Incomplete fusion between two adjacent weld beads or between a weld bead and the base-metal surface

_____c. Nonfused, nonmetallic solids in weld metal

_____d. Incomplete tie-in at root or top of joint between weld-metal and base-metal surfaces

_____e. Groove melted into base metal adjacent to edge of weld and left unfilled by weld metal

_____f. Tendency for arc to wander or whip from its normal course

_____g. Gas pockets in weld metal

_____h. Extension of weld face beyond edge of weld where fusion occurred

1. Arc blow
2. Overlap
3. Undercutting
4. Porosity
5. Slag inclusion
6. Cold lap
7. Incomplete fusion
8. Inadequate penetration

TEST

9. State one cause for each of the common welding problems listed below.

   a. Inadequate penetration —

   b. incomplete fusion —

   c. Cold lap —

   d. Slag inclusion —

   e. Porosity —

   f. Undercutting —

   g. Overlap —

   h. Arc blow —

10. State causes of improperly formed beads. Read each of the bead characteristics below and then write the cause of those characteristics in the blanks provided.

    a. Bead with irregular width and height and insufficient metal deposit, causing poor penetration

    Cause —

    b. Wide, highly piled bead, resulting in poor penetration

    Cause —

    c. Bead with excessive spatter, undercutting of weld joint

    Cause —

TEST

d. Narrow bead with deposited metal piled high, resulting in poor penetration

Cause — ______________________________

e. Flat bead with lack of uniformity on face, resulting in poor penetration

Cause — ______________________________

f. Wide bead with excessive metal deposit

Cause — ______________________________

11. List techniques used when making multiple passes.

a. ______________________________

b. ______________________________

12. State methods of protection from each arc-welding hazard listed below.

Radiation from the arc, ultraviolet and infared rays (State two methods.)

a. ______________________________

____

b. ______________________________

____

Flying sparks and globules of molten metal (State two methods.)

a. ______________________________

____

b. ______________________________

____

Electric shock (State two methods.)

a. ______________________________

____

b. ______________________________

____

TEST

Fumes (State one method.)

____

Burns (State three methods.)

a. ____

b. ____

c. ____

(NOTE: Test items 13 and 14 list the assignment and job sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

13. Analyze poor welds.

14. Demonstrate the ability to

    a. Make a pad in the horizontal position.

    b. Make a single-V-groove butt weld in the horizontal position.

    c. Make a single-V-groove butt weld in the vertical-up position.

    d. Make a single-V-groove butt weld in the overhead position.

    e. Make a T-joint fillet weld in the vertical-up position.

    f. Make a square-groove butt-joint weld in the vertical-down position.

PERFORM POSITION SHIELDED METAL-ARC WELDING
UNIT II

ANSWERS TO TEST

1. a. 1
   b. 9
   c. 6
   d. 7
   e. 3
   f. 2
   g. 8
   h. 4
   i. 5
   j. 10
   k. 11
   l. 13
   m. 12

2. a. 4
   b. 2
   c. 3
   d. 1
   e. 6
   f. 5

3. a. Groove angle
   b. Groove face
   c. Root face
   d. Root opening
   e. Bevel angle

4. a. U-groove
   b. J-groove
   c. Single-V groove
   d. Square groove
   e. Single-bevel groove
   f. Double-bevel groove

5. a. Overhead
   b. Vertical
   c. Horizontal
   d. Flat

6. a. Welding machine and circuit
   b. Electrode
   c. Arc length
   d. Electrode movement

7. a, c, d, e, g, h, j

8. a. 8
   b. 6
   c. 5
   d. 7
   e. 3
   f. 1
   g. 4
   h. 2

9. Answer should include one cause from each of the following

   a. Joint misalignment; failure to completly fill weld with weld metal
   b. Failure to raise base metal to melting point

ANSWERS TO TEST

c. Improper starts; improper current adjustment
d. Rapidly solidifying slag; welding current too low; improper cleaning; nonmetallic elements from flux
e. Chemical reactions taking place during welding; arc too long; wind or other atmospheric conditions
f. High amperage and long arc; incorrect electrode position; wrong travel speed; bad welding technique
g. Bead made with insufficient heat
h. Forces in magnetic field built up around arc in DC arc welding

10. a. Speed too fast
b. Voltage too low
c. Current too high
d. Current too low
e. Voltage too high
f. Speed too slow, causing excessive heat

11. a. Removing slag from beads
b. Lapping beads (fusing beads)

12. **Radiation from the arc, ultraviolet and infared rays** (Answer should include any two of the following.)

a. Wear arc welder's helmet with approved lenses
b. Wear gloves and clothing of sufficient weight to shut out rays from arc
c. Protect others by shielding operation so that they cannot accidentally look directly at arc or have it shine in their eyes

Flying sparks and globules of molten metal (Answer should include any two of the following.)

a. Wear clothing that is not flammable, and remove flammable materials from pockets
b. Wear cuffless trousers, and cover pockets so that they will not collect sparks and globules
c. Wear high shoes with safety toes

Electric shock (Answer should include any two of the following.)

a. Work on a dry floor
b. Use insulated electrode holders
c. Wear dry welding gloves

Fumes — Use proper ventilating equipment

Burns (Answer should include any three of the following.)

a. Use leather welding gloves
b. Wear apron made of leather or heavy, tightly woven cotton
c. Handle hot metal with tongs or pliers
d. Cool metal in quenching tank before handling with hands

ANSWERS TO TEST

13. Evaluated to the satisfaction of the instructor

14. Performance skills evaluated to the satisfaction of the instructor

PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

UNIT OBJECTIVE

After completing this unit, the student should be able to use oxyacetylene equipment to weld with and without filler rods and to braze a butt joint. The student will show this ability by completing the job sheets and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with welding and brazing.
2. Identify parts of oxyacetylene welding and brazing equipment.
3. State safety precautions for handling oxyacetylene welding and brazing equipment.
4. Match types of oxyacetylene welding and brazing flames to their correct characteristics.
5. Distinguish between definitions of oxyacetylene welding and oxyacetylene brazing.
6. List properties of a good weld.
7. List factors that determine a good weld.
8. List factors to consider when selecting proper welding tip.
9. List factors to consider when selecting proper welding rod.
10. Discuss the advantages of brazing.
11. List characteristics of a good braze.
12. List factors that determine a good braze.
13. Match incorrect flame temperatures to their effects on the flow of brazing filler metal.
14. Demonstrate the ability to
    a. Turn on, light and adjust torch, and turn off oxyacetylene equipment.
    b. Lay a bead without a filler rod.
    c. Construct a corner weld without a filler rod.

OBJECTIVE SHEET

d. Lay a bead with a filler rod.

e. Weld a butt joint with a filler rod.

f. Braze a butt joint.

PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

SUGGESTED ACTIVITIES

I. Unit contents

   A. Objective sheet

   B. Suggested activities

      1. Supplement #1 — Lens-Shade Selector

      2. Transparency masters

         a. TM #1 — Oxyacetylene Welding and Brazing Equipment

         b. TM #2 — Oxyacetylene Welding and Brazing Equipment (Continued)

         c. TM #3 — Oxygen Regulator Gauges

         d. TM #4 — Acetylene Regulator Gauges

         e. TM #5 — Oxyacetylene Welding and Brazing Flames

   C. Information sheet

   D. Job sheets

      1. Job Sheet #1 — Turn On, Light and Adjust Torch, and Turn Off Oxyacetylene Equipment

      2. Job Sheet #2 — Lay a Bead Without a Filler Rod

      3. Job Sheet #3 — Construct a Corner Weld Without a Filler Rod

      4. Job Sheet #4 — Lay a Bead with a Filler Rod

      5. Job Sheet #5 — Weld a Butt Joint with a Filler Rod

      6. Job Sheet #6 — Braze a Butt Joint

   E. Test

   F. Answers to test

II. Instructor's guide

   A. Review unit and plan presentation.

SUGGESTED ACTIVITIES

B. Obtain materials to supplement unit.

1. Films

   (NOTE: The following films are available to Oklahoma teachers on a free-loan basis. Oklahoma teachers may order from the Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074. Out-of-state teachers must order from the addresses listed with the films.)

   a. *Air Acetylene Flames*. Color, 16mm, 10 minutes, Films, Inc., 1972.

      (NOTE: This film shows the basic welding techniques and a few examples of the many home and industrial uses of the air acetylene torch flame.)

   b. *Fusion Welding*. Color, 16mm, 20 minutes, Films, Inc., 1972.

      (NOTE: Proper torch, rod-movement, and weld-puddle control techniques are shown through animated and live demonstrations.)

   c. *Fusion Welding for Light-Gauge Steel*. Color, 16mm, 10 minutes, Films, Inc., 1972.

      (NOTE: The proper and improper methods of fusion welding thin sheet metal are demonstrated by close-up action shots and animation.)

   d. *Braze Welding*. Color, 16mm, 13 minutes, Films, Inc., 1972.

      (NOTE: This film demonstrates the correct techniques for braze welding sheet steel, plate, and castings.)

   (NOTE: Films "a" through "d" are available from MacMillan Library Services, 866 Third Avenue, New York, New York 10022; phone 212-935-2000.)

   e. *Oxyacetylene Welding-Torch Techniques*. Color, 16mm, 19 minutes, BFA Educational Media, 1971.

      (NOTE: This film deals mainly in the areas of brazing and fusion welding, but it also demonstrates procedures for tip and rod selection).

   f. *Oxyacetylene Welding Equipment*. Color, 16mm, 16 minutes, BFA Educational Media, 1972.

      (NOTE: This film for beginning students demonstrates the procedures for setting, adjusting, and turning on and off oxyacetylene equipment.)

   (NOTE: Films "e" and "f" are available from BFA Educational Media, 468 Park Avenue South, New York, New York 10016; phone 212-684-5910.)

   g. *Weld in Safety*. Color, 16mm, 23 minutes, Films, Inc., 1981. Available from International Film Bureau, Inc., 332 South Michigan Avenue, Chicago, Illinois, 60604; phone 312-427-4545.

SUGGESTED ACTIVITIES

(NOTE: This film demonstrates safety procedures and precautions for handling gas welding or cutting equipment and cylinders.)

2. Samples of good welds made with and without filler rods

3. Samples of poor welds

4. Tip-size selection chart for your shop's oxyacetylene equipment

   (NOTE: These charts can usually be obtained from your equipment supplier.)

5. Sample of a good braze

6. Samples of poor brazes

7. Sufficient supplies of safety equipment, gases, rods, fluxes, tips, and metal and filler metal needed for the job sheets

8. Transparencies and competency profiles

   (NOTE: Transparencies and competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

C. Provide students with unit.

D. Introduce unit.

SUGGESTIONS:

- Show the films *Air Acetylene Flames* and *Braze Welding*. Explain to students that oxyacetylene welding and brazing are very useful skills that can often be used at home and in agriculture and industry.
- Point out the differences between arc welding and oxyacetylene welding. Stress that oxyacetylene welding is very useful when you need to weld metal that is too thin to be welded with an arc welder.
- Show the film *Fusion Welding for Light-Gauge Steel*.
- Discuss unit and specific objectives.

E. Discuss information and job sheets.

1. Use Information Sheet, Section I to introduce terms associated with oxyacetylene brazing and welding.

   SUGGESTIONS:

   - Go to the shop to demonstrate terms such as *inner cone, tack, distortion, purge, cylinder, regulator, cylinder valve,* and *soldering*.

SUGGESTED ACTIVITIES

- Point out the differences between backfire and flashback. Stress that backfire is a dangerous condition, and have students review the steps for preventing backfire. See the "Oxy-Gas" unit in *Vocational Agriculture I.*
- Show the class weld samples to demonstrate terms such as *penetration* and *base metal*.
- Discuss the brazing alloys: bronze and brass. Point out that brass is the most common filler material used in brazing and discuss the reasons why.

2. Use Information Sheet, Sections II and III to discuss parts of oxyacetylene welding and brazing equipment and safety precautions for handling oxyacetylene welding and brazing equipment.

SUGGESTIONS:

- Take the class to the shop or use Transparencies #1 through #4 to discuss each part of the oxyacetylene equipment. Be sure to stress that regulators are delicate instruments and should be handled very carefully.
- Point out that using oxyacetylene equipment does present certain dangers but that these dangers can be avoided if the equipment is handled properly. Go through each of the safety precautions presented in Section III and explain to students why each of these precautions is important.
- Explain your shop policies and procedures for using oxyacetylene equipment.
- Use Supplement #1, Lens-Shade Selector, to discuss lens-shade numbers required for oxyacetylene welding and brazing.
- Show the film *Weld in Safety*.

3. Use Information Sheet, Section IV to discuss types of oxyacetylene welding and brazing flames and their characteristics.

SUGGESTIONS:

- Show the class Transparency #5 and explain to students that the torch flame is usually adjusted to a neutral flame when welding and brazing. Stress the characteristics of the neutral flame, but also discuss the characteristics of the oxidizing and carburizing flames and explain why the neutral flame is preferred.
- Show the film *Oxyacetylene Welding Equipment*.
- Demonstrate the techniques used in Job Sheet #1.
- Have students complete Job Sheet #1.

SUGGESTED ACTIVITIES

4. Use Information Sheet, Section V to discuss the differences in oxyacetylene welding and brazing.

   SUGGESTION:

   - Show the class weld and braze samples and point out that in oxyacetylene welding high temperatures are used to actually melt and then fuse base metals; whereas, in oxyacetylene brazing lower temperatures are used because base metals are not melted; they are only heated enough to melt the filler material.

5. Use Information Sheet, Sections VI and VII to discuss properties of a good weld and factors that determine a good weld.

   SUGGESTIONS:

   - Show the class prepared samples of ideal welds made with and without filler. Point out the slightly convex crown, consistent width, clean appearance, good penetration, and good fusion found in a good weld. Then go to the shop and demonstrate how proper flame adjustment, torch position, and flame-movement pattern must all work together correctly in order to produce a good weld.

   - Demonstrate troubleshooting techniques used to correct the welding problems that can cause poor welds.

6. Use Information Sheet, Sections VIII and IX to discuss factors to consider when selecting proper welding tip and welding rod.

   SUGGESTIONS:

   - Discuss the relationship of welding-rod size, tip size, and thickness of metal. Explain that the thickness of the base metal will usually govern welding-rod size and tip size, because a small tip and a small welding rod are used to weld thin metal and a larger welding rod and tip are used to weld thicker metal.

   - Tell the class that, in general, the size of the tip orifice (the size of the hole that allows welding gases to flow through it) determines the amount of acetylene and oxygen fed to the flame and, therefore, determines the amount of heat produced by the torch. The larger the orifice, the greater the amount of heat generated. If the torch-tip orifice is too small, not enough heat may be generated to bring the base metal to its melting point. If the torch-tip orifice is too large, too much heat may be generated and the welding-rod and base-metal melting will be hard to control.

SUGGESTED ACTIVITIES

- Point out that the tip size found stamped on the tip is determined by the size of the tip orifice. Explain that manufacturers do not have a standard numbering system to indicate tip size; therefore, when selecting the proper tip number, always follow the manufacturer's recommendations for your particular brand of equipment. Use the chart in the information sheet or use a tip-selection chart from your equipment supplier to illustrate the relationship between tip size, base-metal thickness, filler-rod sizes, gas pressures, and consumption rates.

- Show the film *Oxyacetylene Welding-Torch Techniques*.

7. Use Information Sheet, Section X to discuss the advantages of brazing as compared to welding and soldering.

SUGGESTIONS:

- Review the differences in the processes used in brazing, welding, and soldering.

- Point out that brazing produces a stronger joint than soldering and, in certain instances, provides as strong a joint as welding. Explain that brazing uses lower temperatures than welding, causing less distortion from heat and making brazing ideal for joining thin metals and heat-treated metals such as spring steel.

- Also explain that brazing is especially convenient because with brazing it is possible to join dissimilar metals. Give examples of instances when this advantage is especially useful.

8. Use Information Sheet, Sections XI through XIII to discuss the characteristics of a good braze, the factors that determine a good braze, and the effects of incorrect flame temperature on the flow of brazing metal.

SUGGESTIONS:

- Show the class a prepared sample of a good braze. Point out that the filler metal must penetrate through the joint and adhere to the base metal and that there must be little or no melting of the base metal. Then go to the shop and demonstrate how cleaning the base metal, maintaining joint fit-up and proper support for the base materials, and selecting proper filler metal, flux, and flame adjustment must all work together correctly to produce a good braze.

- Explain that properly cleaning base metals, proper joint fit-up, and proper support for base metals during brazing are as critical as filler metal, flux, and flame adjustment in producing a good braze.

- Discuss the brazing filler metals (bronze and brass) and the purpose of flux. Show or display samples of the different forms of flux: powder, paste, or prefluxed rod.

SUGGESTED ACTIVITIES

- Give guidelines for determining which types of filler metal to use for different brazing techniques.
- Demonstrate troubleshooting techniques used to correct the problems that can cause a poor braze.
- Demonstrate the techniques used in Job Sheet #6.
- Have students complete Job Sheet #6 and turn in their finished plates.

9. Show the film *Fusion Welding* to further demonstrate oxyacetylene welding techniques.
10. Demonstrate the techniques used in Job Sheets #2 through #5.
11. Have students complete Job Sheets #2 through #5 and turn in their finished plates.

F. Evaluate finished plates and return to students.

G. Give test.

H. Critique test and discuss in class.

I. Reteach and retest as necessary.

J. Complete appropriate section of competency profiles.

III. Unit references

A. Althouse, Andrew D., Carl H. Turnquist, and William A. Bowditch. *Modern Welding*. South Holland, Illinois: The Goodheart-Willcox Co., Inc., 1980.

B. Braker, Clifton R. "Pete." *Vocational Agriculture II*, rev. ed. Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1975.

C. Harp, Keith, and Bob Patton. *Vocational Agriculture I.* Stillwater, Oklahoma: State Department of Vocational and Technical Educational/Curriculum and Instructional Materials Center, 1984.

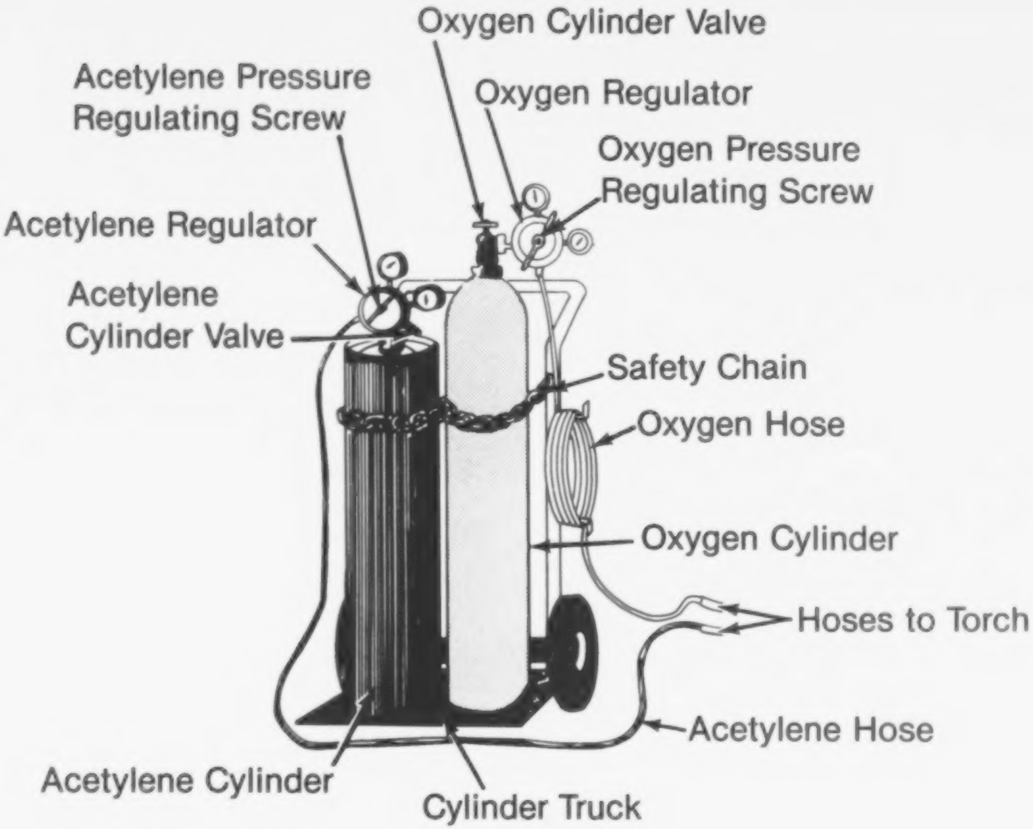
SUGGESTED ACTIVITIES

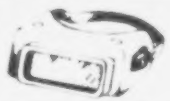
SUPPLEMENT #1 — LENS-SHADE SELECTOR

Type of operation	Shade number
Soldering	2
Torch brazing	3 or 4
Oxygen cutting	
Base-metal thickness	
0 to 1 inch	3 or 4
1 to 6 inches	4 or 5
6 inches and over	5 or 6
Gas welding	
Base-metal thickness	
0 to 1/8 inch	4 or 5
1/8 to 1/2 inch	5 or 6
1/2 inch and over	6 or 8
Shielded metal-arc welding	
1/16-, 3/4-, 1/8-, 5/32-inch electrodes	9 to 14
Gas-metal arc welding	9 to 14
Gas-tungsten arc welding (nonferrous), gas-metal arc welding (nonferrous) 1/16-,3/32-, 1/8-, 5/32-inch electrodes	9 to 14
Gas-tungsten arc welding (ferrous), gas-metal arc welding (ferrous) 1/16-, 3/32-, 1/8-, 5/32-inch electrodes	9 to 14

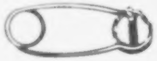
(NOTE: In oxyacetylene welding and cutting, lens-shade requirements are based on metal thickness, but in gas-shielded arc welding, lens-shade requirements are based on electrode size, the amperage range of the electrode, and base-metal properties.)

Oxyacetylene Welding and Brazing Equipment

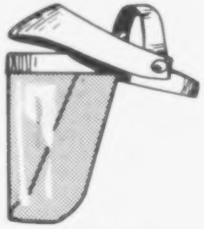

Oxygen Cylinder Valve
Acetylene Pressure Regulating Screw
Oxygen Regulator
Oxygen Pressure Regulating Screw
Acetylene Regulator
Acetylene Cylinder Valve
Safety Chain
Oxygen Hose
Oxygen Cylinder
Hoses to Torch
Acetylene Hose
Acetylene Cylinder
Cylinder Truck



Oxy-Gas Welding and Cutting Goggles



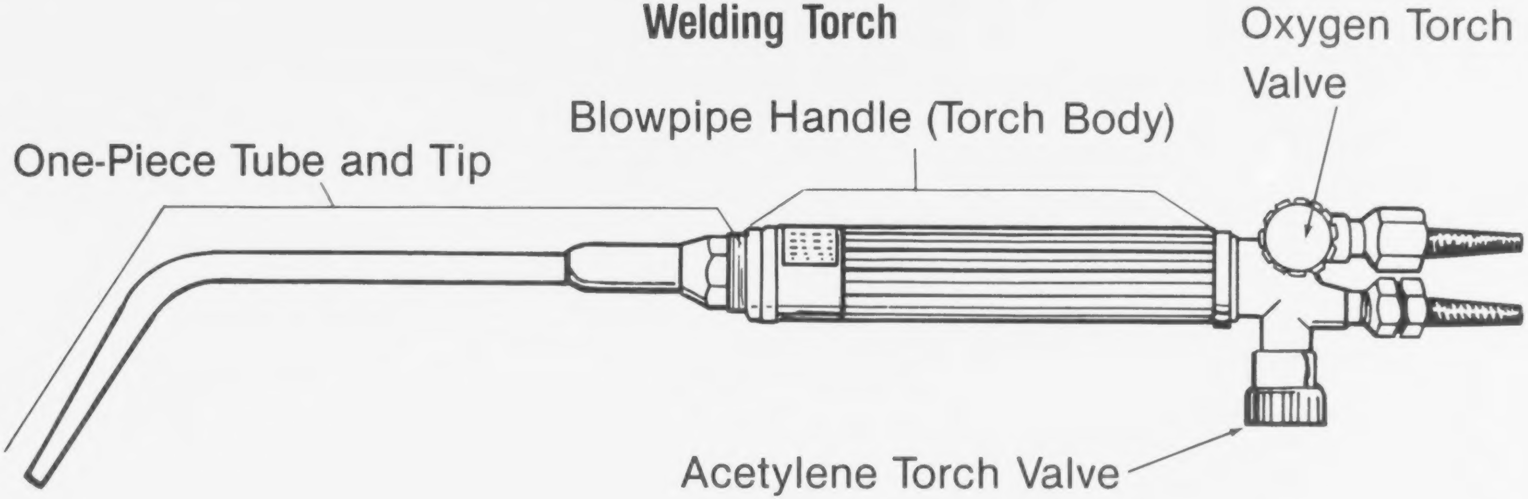
Flint Lighter



Shaded Face Shield

Oxyacetylene Welding and Brazing Equipment
(Continued)

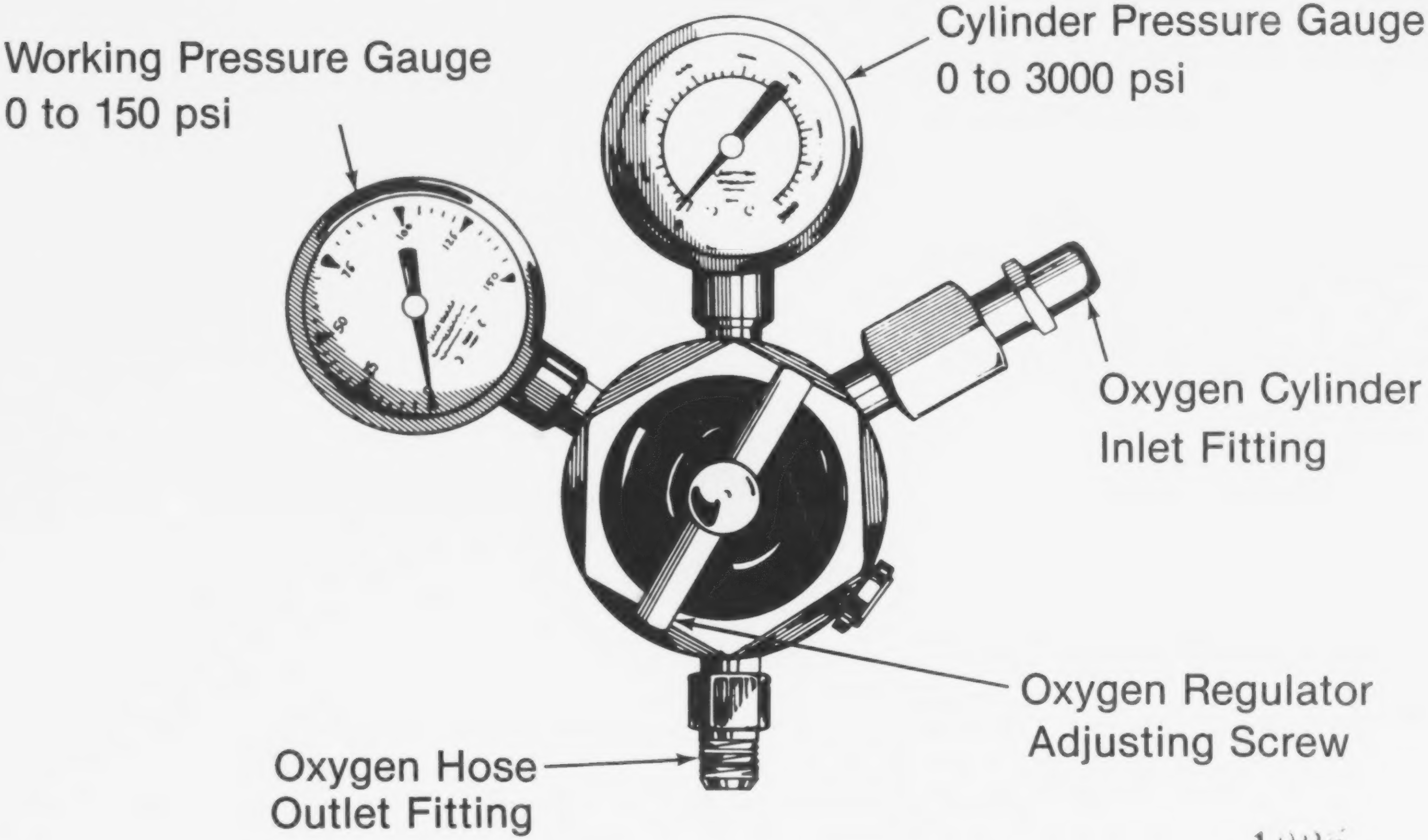
Welding Torch


Oxygen Torch Valve
Blowpipe Handle (Torch Body)
One-Piece Tube and Tip
Acetylene Torch Valve

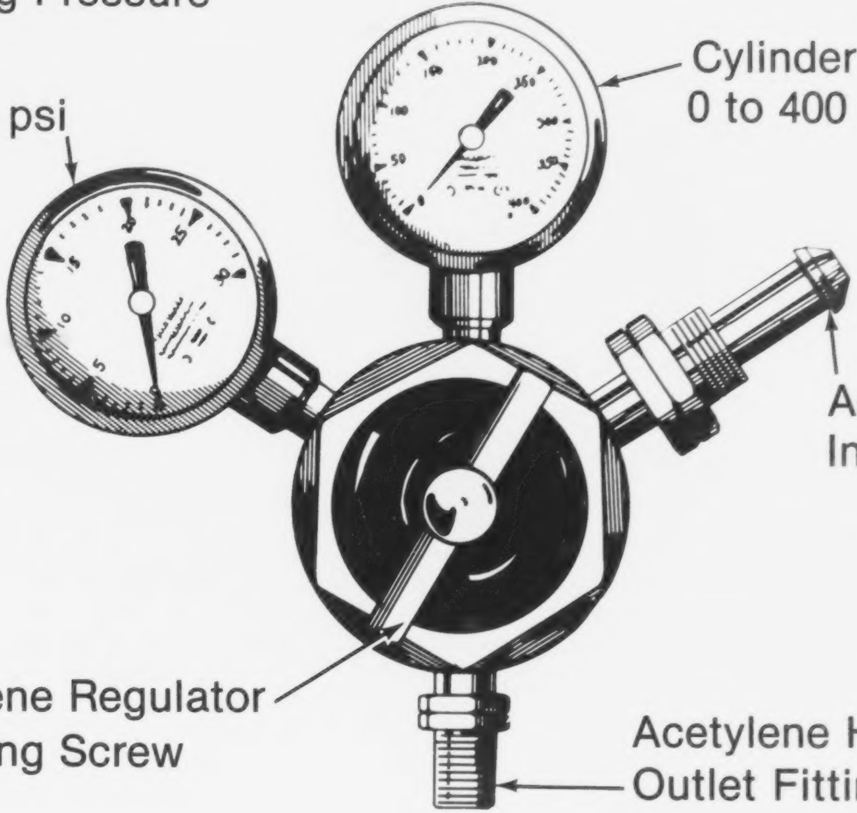
1022

1023

Oxygen Regulator Gauges


Working Pressure Gauge
0 to 150 psi
Cylinder Pressure Gauge
0 to 3000 psi
Oxygen Cylinder
Inlet Fitting
Oxygen Regulator
Adjusting Screw
Oxygen Hose
Outlet Fitting

Acetylene Regulator Gauges



Working Pressure
Gauge
0 to 30 psi

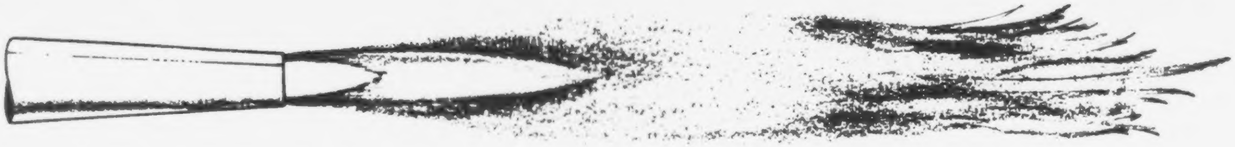
Cylinder Pressure Gauge
0 to 400 psi

Acetylene Cylinder
Inlet Fitting

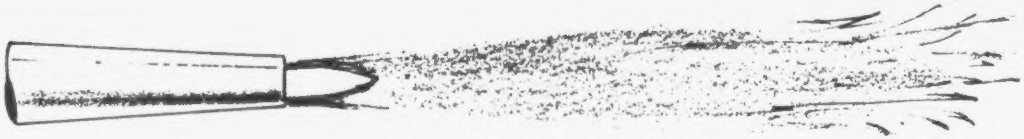
Acetylene Regulator
Adjusting Screw

Acetylene Hose
Outlet Fitting

Oxyacetylene Welding and Brazing Flames



Carburizing Flame



Neutral Flame

Oxidizing Flame

PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

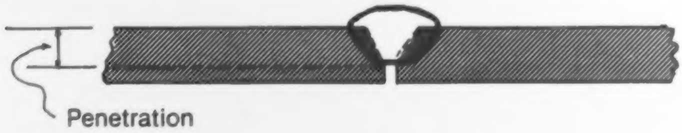
INFORMATION SHEET

I. Terms and definitions associated with welding and brazing

A. Penetration — Extent to which filler metal combines with base metal when welding; measured from surface of base metal (Figure 1)

EXAMPLE:

FIGURE 1

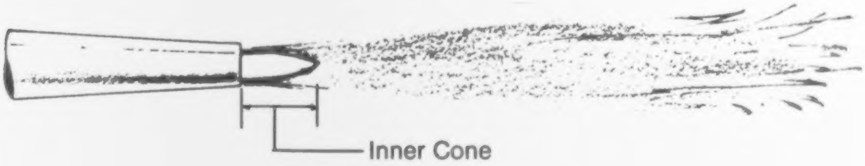


B. Base metal — Metal to be welded or brazed

C. Inner cone — Inner white part of neutral flame (Figure 2)

EXAMPLE:

FIGURE 2

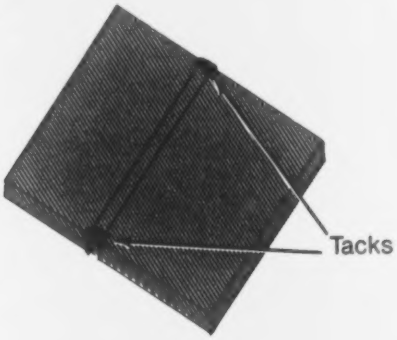


D. Tack — Light weld or braze used to hold base metals together (Figure 3)

(NOTE: If you do not tack base metals at each end of the gap before starting to weld or braze, heat distortion will widen the gap before the weld or braze can be completed.)

EXAMPLE:

FIGURE 3



INFORMATION SHEET

E. Distortion — Warping or movement of metal due to intense concentration of heat

F. Backfire — Condition in which flame momentarily burns into tip; characterized by a loud snap or pop and the flame either going out or continuing to burn

G. Flashback — Dangerous condition in which flame burns back inside torch body; characterized by a hissing sound and smoke and/or sparks emitted from torch tip

H. Filler rod — Metal rod that is melted and added to puddle to increase substance of bead

I. Purge — Process of forcing gases through hoses and torch to remove foreign materials or impurities

J. Cylinder — Portable container used to transport and store compressed gas

K. Regulator — Tool attached to cylinder; controls gas flow at a constant rate; has two gauges: one that shows pressure in cylinder, and one that shows working pressure going to torch

L. Cylinder valve — Valve installed in top of cylinder to turn the flow of gas from cylinder on and off

M. Alloy — Mixture with metallic properties; composed of two or more elements of which at least one is a metal

N. Brass — Alloy consisting chiefly of copper and zinc; most common filler material used in brazing

O. Bronze — Alloy consisting chiefly of copper and tin; less common filler material used in brazing

P. Flux — Material used to prevent, dissolve, or help remove oxides or other undesirable substances from filler metal in brazing or welding

(NOTE: Flux is an essential component in the brazing process. A wide variety of fluxes exist, including rods that are precoated with flux and are very convenient. Selection of flux should be based on the type of base metal to be brazed.)

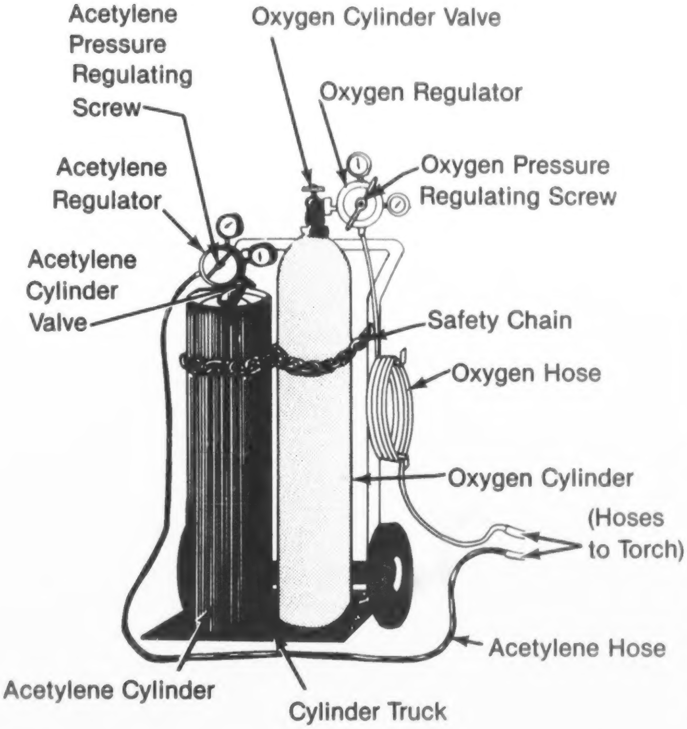
Q. Soldering — Method in which base metals are heated so that a metal or metallic alloy (usually an alloy of lead and tin) melts and then cools to join base metals

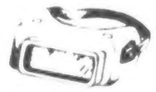
INFORMATION SHEET

II. Parts of oxyacetylene welding and brazing equipment (Figure 4)

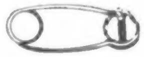
(NOTE: The shaded face shield is acceptable for oxyacetylene operations *only* when equipped with a shaded filter shield. A clear face shield is *not* acceptable.)

FIGURE 4

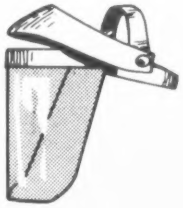

Acetylene Pressure Regulating Screw
Oxygen Cylinder Valve
Oxygen Regulator
Acetylene Regulator
Oxygen Pressure Regulating Screw
Acetylene Cylinder Valve
Safety Chain
Oxygen Hose
Oxygen Cylinder
(Hoses to Torch)
Acetylene Hose
Acetylene Cylinder
Cylinder Truck



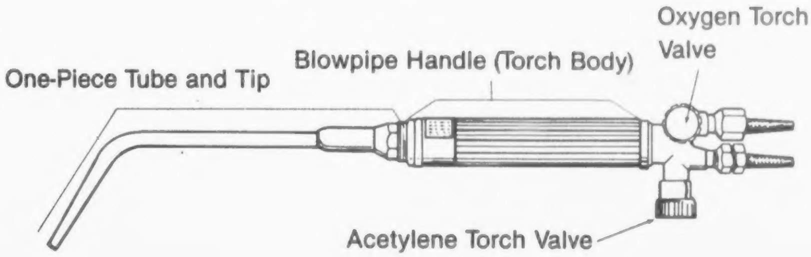
Oxy-Gas Welding and Cutting Goggles



Flint Lighter



Shaded Face Shield


Oxygen Torch Valve
One-Piece Tube and Tip
Blowpipe Handle (Torch Body)
Acetylene Torch Valve

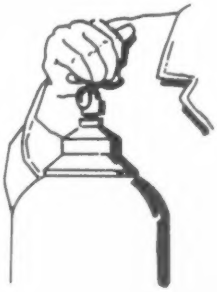
INFORMATION SHEET

III. Safety precautions for handling oxyacetylene welding and brazing equipment (Figures 5 - 14)

A. Before attaching regulators, blow out cylinder valve by opening and closing valve quickly

EXAMPLE:

FIGURE 5

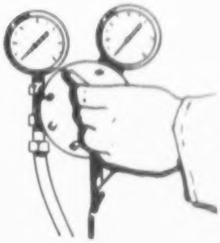


Used with permission of Smith Welding Equipment, a division of Tescom Corporation.

B. Before opening cylinder valves, check to make sure that adjusting screws on regulators are loose

EXAMPLE:

FIGURE 6

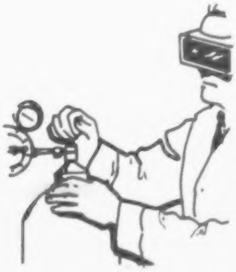


Used with permission of Smith Welding Equipment, a division of Tescom Corporation

C. Stand to one side of regulator when opening cylinder valve

EXAMPLE:

FIGURE 7



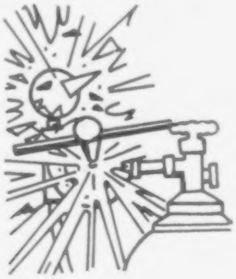
Adapted with permission of Smith Welding Equipment, a division of Tescom Corporation.

INFORMATION SHEET

D. Open cylinder valve slowly to prevent explosions

EXAMPLE:

FIGURE 8



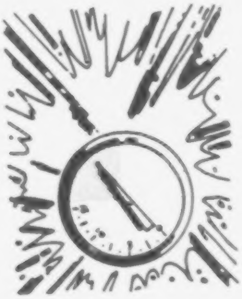
Used with permission of Smith Welding Equipment, a division of Tescom Corporation.

E. Do not use or compress acetylene (in free state) at pressures greater than 15 pounds per square inch (psi)

(NOTE: Acetylene becomes unstable and highly explosive at pressures above 15 psi.)

EXAMPLE:

FIGURE 9

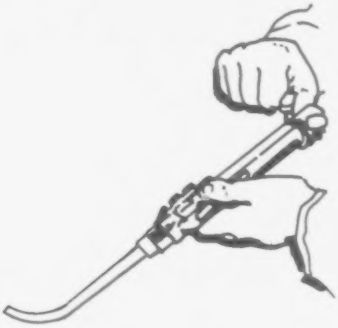


Used with permission of Smith Welding Equipment, a division of Tescom Corporation.

F. Purge oxygen and acetylene passages individually before lighting torches

EXAMPLE:

FIGURE 10



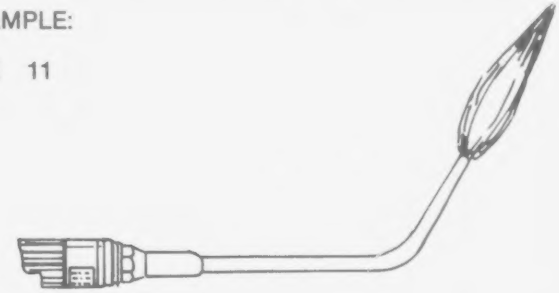
Adapted with permission of Smith Welding Equipment, a division of Tescom Corporation.

INFORMATION SHEET

G. Light acetylene before opening oxygen valve on torch

EXAMPLE:

FIGURE 11

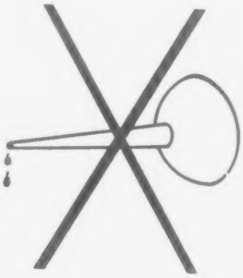


Adapted with permission of Smith Welding Equipment, a division of Tescom Corporation.

H. Never use oil or grease on regulators, torches, fittings, or other equipment in contact with oxygen

EXAMPLE:

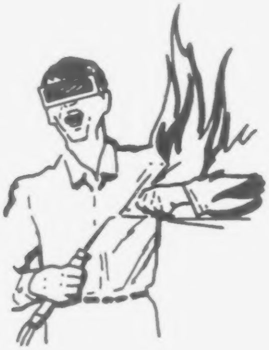
FIGURE 12



I. Never use oxygen as a substitute for compressed air

EXAMPLE:

FIGURE 13



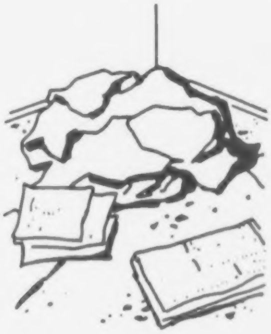
Adapted with permission of Smith Welding Equipment, a division of Tescom Corporation.

INFORMATION SHEET

J. Keep combustible materials away from work areas

EXAMPLE:

FIGURE 14



Used with permission of Smith Welding Equipment, a division of Tescom Corporation.

K. Have CO_2 or dry-powder fire extinguisher available

L. Test connections for leaks with Ivory soap suds, paintbrush, and water

M. Always use flint lighter to light torch

N. Always wear leather welding gloves

(NOTE: Use tongs to handle hot materials. Never pick up hot materials with the gloves, as this hardens the leather and causes the gloves to lose their flexibility and usability.)

O. Always wear oxy-gas welding goggles

(NOTE: The suggested shade range for oxy-gas welding is 4 through 8.)

P. Wear protective clothing to cover all parts of the body

EXAMPLES: Long-sleeved nonsynthetic shirt, trousers with no cuffs and no frays, high-topped leather shoes or boots

Q. Never weld on containers that have been used for storing combustible materials

EXAMPLE: Gas tanks

R. Never weld on concrete

S. Always weld at least 5 feet away from cylinders

T. Always operate torch in a well-ventilated area

(NOTE: When heated, many metals release irritating and toxic fumes. If it is necessary to perform welding operations on cadmium-coated metals, galvanized metal, or metal containing lead, very thorough ventilation must be provided.)

U. Never leave a burning torch unattended

INFORMATION SHEET

V. Always place steel caps on cylinders when they are being moved or are in storage

W. Shut off cylinder valves when not in use to reduce the possibility of leakage and strain on equipment

X. Turn off acetylene torch valve first so that flame will go out immediately

Y. Always support or store cylinders in an upright position

(NOTE: Acetylene gas is suspended within liquid acetone. If used in a horizontal position, the acetone may be withdrawn and damage some parts within the oxyacetylene system.)

Z. Keep long hair tied back

IV. Characteristics of types of oxyacetylene welding and brazing flames (Table 1)

(NOTE: The neutral flame is the one used in most welding and brazing operations.)

TABLE 1: Oxyacetylene flames and their characteristics

Type of flame	Characteristics
Carburizing	Contains excess of acetylene gas in flame; burns extra acetylene, causing carbon to be introduced into weld, which makes metal brittle
Neutral	Burns equal parts of oxygen and acetylene; has clear, well-defined, white inner cone; does not show acetylene feather
Oxidizing	Contains excess of oxygen in flame; has short inner cone, and makes whistling sound; oxidizes metal, causing it to become brittle

INFORMATION SHEET

V. Definitions of oxyacetylene welding and oxyacetylene brazing

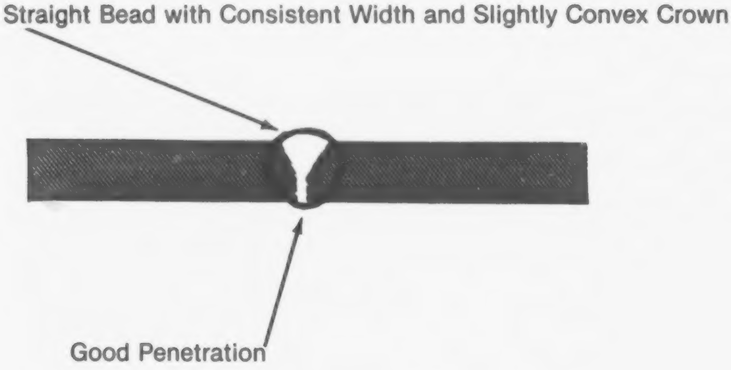
A. Oxyacetylene brazing — Method in which an oxyacetylene flame heats, but does not melt, base metals so that filler metal melts to join base metal through adhesion

B. Oxyacetylene welding — Method in which a high-temperature oxyacetylene flame melts and joins base metals, or base metals and filler metal, through fusion

VI. Properties of a good weld (Figure 15)

EXAMPLE:

FIGURE 15


Straight Bead with Consistent Width and Slightly Convex Crown
Good Penetration

A. Straight, consistent bead

B. Slightly convex crown

C. Clean appearance

D. Good penetration

E. Good fusion

VII. Factors that determine a good weld

A. Proper flame adjustment

(NOTE: Proper flame adjustment involves selecting the proper torch-tip size and mixing the acetylene and oxygen in the proper amounts to achieve the correct amount of heat.)

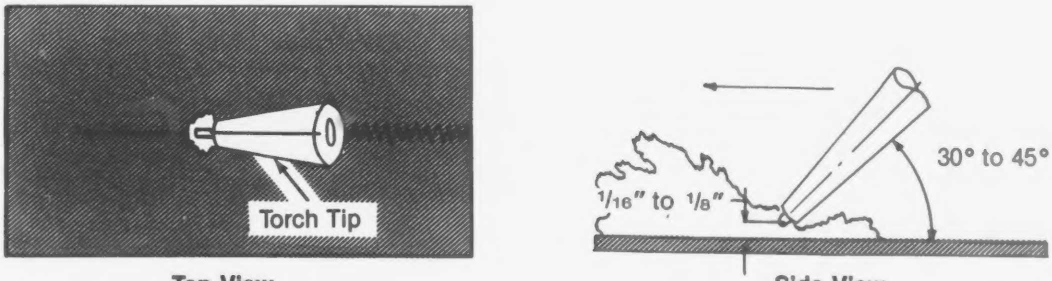
B. Proper torch position

(NOTE: Proper torch position includes both the angle that the torch tip is held over the base metal and the distance that the flame is held above the base metal. See Figure 16.)

INFORMATION SHEET

EXAMPLE:

FIGURE 16: Recommended torch angle and flame distance in the flat position



Top View **Side View**

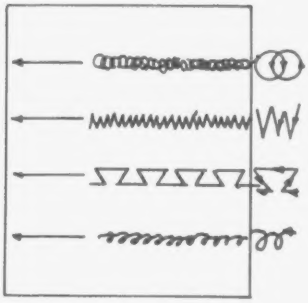
Source: *Modern Welding*

C. Proper flame-movement pattern (Figure 17)

(NOTE: The flame-movement pattern should be constant in both forward speed and width of motion.)

EXAMPLE:

FIGURE 17: Common types of flame-movement patterns for oxyacetylene welding



Source: *Modern Welding*

D. Proper welding rod

(NOTE: When a filler rod is used to complete the weld, proper rod-size selection is an important factor in producing a good weld.)

INFORMATION SHEET

VIII. Factors to consider when selecting proper welding tip

(NOTE: The manufacturer's recommendations for your particular brand of equipment should always be followed. However, in general, the size of the tip orifice determines the amount of heat produced by the torch. The larger the orifice, the greater the amount of heat generated. If the torch-tip orifice is too small, not enough heat may be generated to bring the base metal to its melting point. If the torch-tip orifice is too large, too much heat may be generated and the filler-rod and base-metal melting will be hard to control. See Table 2 to review the relationship between metal thickness, tip size, filler-rod size, and gas pressures and consumption rates.)

EXAMPLE:

TABLE 2:

Metal thickness	Tip size	Size* welding tip orifice	Welding rod diameter	Oxygen		Acetylene		Welding speed ft/hr
				Pressure	Cu ft/hr	Pressure	Cu ft/hr	
1/32	000	74	1/16 in	1	1.1	1	1	
1/16	00	69	1/16 in	1	2.2	1	2	
3/32	0	64	1/16 in or 3/32 in	2	5.5	2	5	20
1/8	1	57	3/32 in or 1/8 in	3	9.9	3	9	16
3/16	2	55	1/8 in	4	17.6	4	16	14
1/4	3	52	1/8 in or 3/16 in	5	27.5	5	25	12
5/16	4	49	1/8 in or 3/16 in	6	33.0	6	30	10
3/8	5	45	3/16 in	7	44.0	7	40	9
1/2	6	42	3/16 in	7	66.0	7	60	8

* Note the tip orifice size as shown is the number drill size. These recommendations are approximate. The torch manufacturers' recommendations should be carefully followed.

A. Thickness of metal to be welded

B. Size of welding rod to be used

IX. Factors to consider when selecting proper welding rod

A. Thickness of metal to be welded

(NOTE: In general, use a large welding rod when welding thick metal and a small welding rod when welding thin metal.)

INFORMATION SHEET

B. Properties of metal to be welded

(NOTE: Use a rod that has properties similar to those of the base metal. For example, use a mild-steel rod to weld mild steel.)

C. Size of welding tip to be used

X. Advantages of brazing

A. Provides a stronger joint than soldering

B. In certain instances, provides as strong a joint as welding

C. Has less effect on heat treatment of base metal than welding

D. Creates less warpage of base metals than welding

E. Provides mechanical strength and pressure-proof joints

F. Makes it possible to join dissimiliar metals

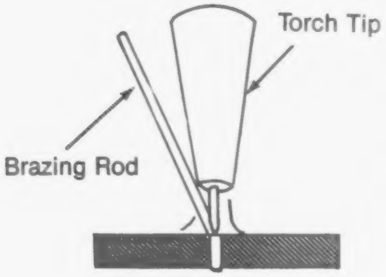
EXAMPLES: Steel tubing may be brazed to cast iron; copper tubing may be brazed to steel; tool steel may be brazed to low-carbon steel.

XI. Characteristics of a good braze

A. Good penetration of filler metal through joint (Figure 18)

EXAMPLE:

FIGURE 18



Brazing filler metal penetrates through the complete thickness of joint.

Source: *Modern Welding*

INFORMATION SHEET

B. Good adhesion of filler metal to base metal

C. Very little or no melting of base metal

XII. Factors that determine a good braze

A. Clean base metal

(NOTE: Base metals must be carefully cleaned before a good braze can be achieved.)

B. Proper joint fit-up

(NOTE: The metals to be joined should not be spaced too far apart or too close together.)

C. Proper support for base metals

(NOTE: Proper support is needed to prevent movement. Any movement of either piece of metal while the filler alloy is molten will weaken the joint.)

D. Proper filler metal and flux

(NOTE: Brazing filler metal [usually brass or bronze] and flux are brought into contact with the base metals at the point where the braze is to be made. Flux is added in powder or paste form or as a coating on the filler rod. Flux reduces oxidation and floats oxides to the surface.)

E. Proper flame adjustment

(NOTE: Tip size and gas mixture must be adjusted to produce a flame that will heat the base metal to a temperature below its melting point but will heat filler metal to a temperature slightly above its melting point so that it flows properly.)

XIII. Effects of flame temperature on the flow of brazing filler metal

(NOTE: If the flame temperature is correct, the molten filler metal will spread evenly and flow over a considerable area of the joint. If the flame temperature is too hot or too cool, proper flow will be affected. Tip size and gas mixture both must be adjusted properly to obtain the proper flame temperature to produce the correct flow of brazing filler metal. Correcting problems with filler-metal flow may require adjusting either the tip size or the gas mixture.)

A. Molten filler metal tends to boil and form little balls—Flame temperature is too hot

B. Filler metal forms into drops—Flame temperature is too cool

PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

JOB SHEET #1 — TURN ON, LIGHT AND ADJUST TORCH, AND TURN OFF OXYACETYLENE EQUIPMENT

I. Equipment and materials

A. Oxyacetylene welding unit with tip assembly

B. Wrench

C. Flint lighter

D. Leather gloves

E. Shaded welding goggles or shaded face shield

F. Safety glasses

G. Coveralls or other protective clothing

H. Tip selection guide

II. Procedure for turning on, lighting, and adjusting torch to a neutral, carburizing, and oxidizing flame

(NOTE: Safety glasses or goggles should be worn in the shop at all times.)

A. Check all cylinder, regulator, and torch valves to make sure that they are off

B. Open acetylene cylinder valve one-half to three-quarters of a turn

CAUTION

Never open acetylene cylinder valve more than one-and-one-half turns.

C. Open acetylene valve on torch one turn to purge line

D. Turn adjusting screw on acetylene regulator clockwise until desired working pressure is reached

(NOTE: Oxygen and acetylene pressures and tip size depend upon the thickness of the metal to be welded. Use pressures and tip size recommended by the manufacturer.)

E. Close acetylene valve on torch

F. Open oxygen cylinder valve all the way and tighten in open position

G. Open oxygen torch valve one turn to purge line

JOB SHEET #1

H. Turn adjusting screw on oxygen regulator clockwise until desired working pressure is reached

   (NOTE: Oxygen and acetylene pressures and tip size depend upon the thickness of the metal to be welded. Use pressures and tip size recommended by manufacturer.)

I. Close oxygen valve on torch

J. Open acetylene valve on torch one-quarter turn

K. Light torch with flint lighter, and adjust until smoke on flame clears

L. Open oxygen valve slowly and adjust to a neutral flame with a tiny trace of feather on inner cone

M. Adjust to a carburizing flame by slowly closing oxygen torch valve until an excess acetylene feather is produced

N. Adjust to an oxidizing flame by slowly opening oxygen torch valve until a short, white inner cone is produced

III. Procedure for turning off the flame and oxyacetylene unit

A. Close acetylene valve on torch

B. Close oxygen valve on torch

C. Close acetylene cylinder valve

D. Close oxygen cylinder valve

E. Open acetylene valve on torch

F. Close acetylene valve on torch when gauges reach zero

G. Release adjusting screw on acetylene regulator by turning counterclockwise

H. Open oxygen valve on torch

I. Close oxygen valve on torch when gauges reach zero

J. Release adjusting screw on oxygen regulator by turning counterclockwise

K. Close oxygen valve on torch

L. Place torch and hose on hanger or brackets provided

M. Clean work area and store equipment and materials properly

PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

JOB SHEET #2 — LAY A BEAD WITHOUT A FILLER ROD

I. Equipment and materials

  A. Oxyacetylene welding unit with tip assembly

  B. Wrench

  C. Flint lighter

  D. Leather gloves

  E. Coveralls or other protective clothing

  F. Shaded welding goggles or shaded face shield

  G. Safety glasses

  H. Pliers

  I. Wire brush

  J. Fire brick

  K. One 1¼" × 6" 16-gauge mild-steel strip

  L. Tip selection guide

II. Procedure

(NOTE: Safety glasses or goggles should be worn in the shop at all times.)

  A. Prepare metal for welding

  B. Place metal in flat welding position on fire brick

  C. Turn on oxyacetylene unit and set working pressure (See Job Sheet #1)

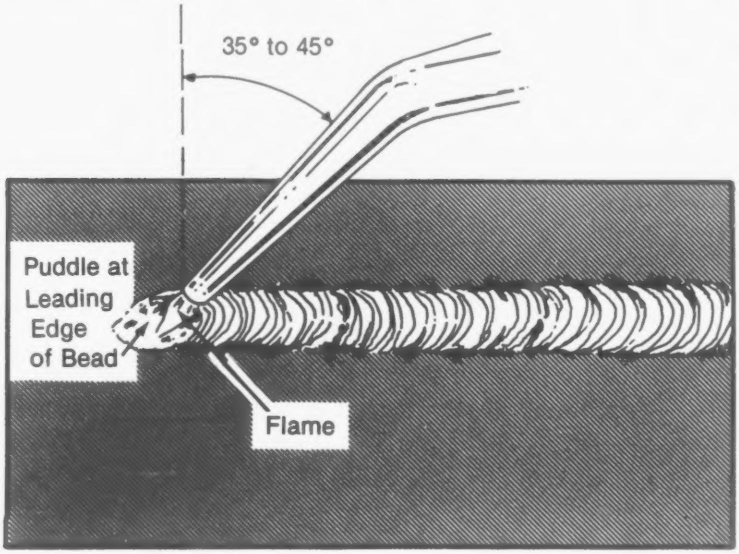
  D. Light torch and adjust to a neutral flame (See Job Sheet #1)

  E. Holding inner cone $^1/_{16}$ to $^1/_8$ inch from surface of base metal, establish a molten puddle at one end of center of strip

JOB SHEET #2

F. Holding torch at a 30- to 45-degree angle down from vertical with tip pointed in direction of travel, begin bead, using torch motion recommended by instructor and carrying puddle at leading edge of bead (Figure 19)

FIGURE 19



G. Move torch slowly forward, allowing metal to melt until you have completed weld

H. Turn off torch (See Job Sheet #1)

I. Clean bead with wire brush

J. Turn in completed work to your instructor for evaluation

K. Clean work area and store equipment and materials properly

PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

JOB SHEET #3 — CONSTRUCT A CORNER WELD WITHOUT A FILLER ROD

I. Equipment and materials

   A. Oxyacetylene welding unit with tip assembly

   B. Wrench

   C. Flint lighter

   D. Leather gloves

   E. Shaded welding goggles or shaded face shield

   F. Safety glasses

   G. Coveralls or other protective clothing

   H. Pliers

   I. Wire brush

   J. Tip selection guide

   K. Fire brick

   L. Two 1¼" x 6" 16-gauge mild-steel strips

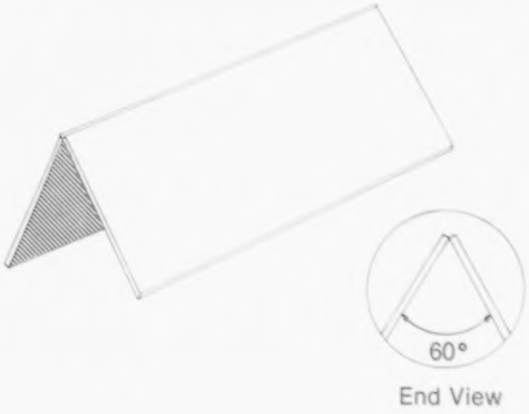
II. Procedure

   (NOTE: Safety glasses or goggles should be worn in the shop at all times.)

   A. Prepare metal for welding

   B. Place metal strips on fire brick so that they form a 60-degree angle (Figure 20)

FIGURE 20



JOB SHEET #3

C. Turn on oxyacetylene unit and set working pressure (See Job Sheet #1)

D. Light torch and adjust to a neutral flame (See Job Sheet #1)

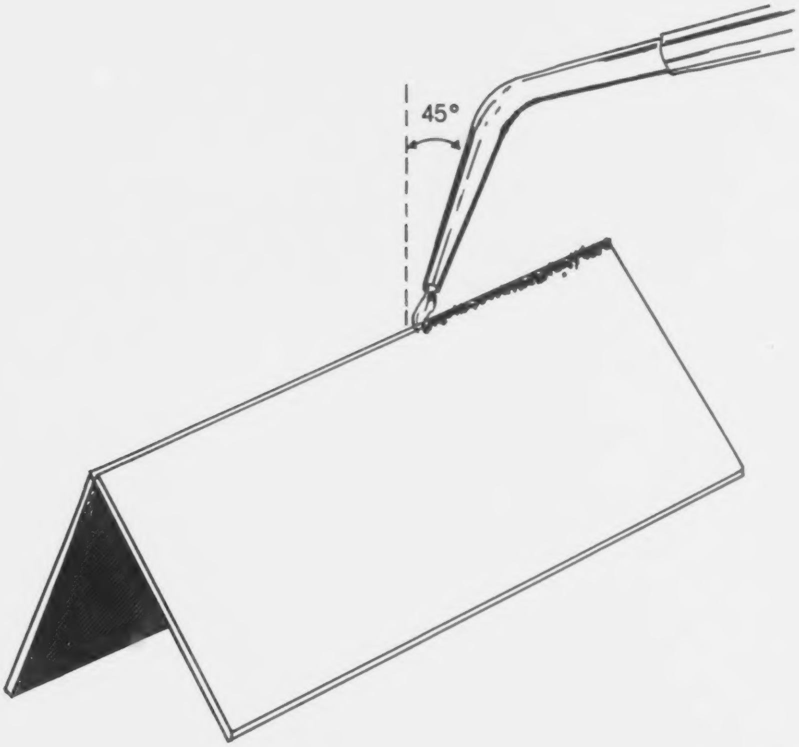
E. Tack-weld metal at each end of joint

F. Holding inner cone $^1/_{16}$ to $^1/_8$ inch from one end of joint, establish a molten puddle

G. Holding torch at a 45-degree angle down from vertical, with tip pointed in direction of travel, begin bead, slowly moving flame and puddle down joint, using torch manipulation pattern determined by instructor (Figure 21)

(NOTE: Keep puddle the same size and shape throughout bead.)

FIGURE 21



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JOB SHEET #3

H. Complete bead, maintaining torch angle and speed

I. Turn off torch (See Job Sheet #1)

J. Examine welded joint for good bead characteristics and penetration

(NOTE: If joint is welded properly, you should be able to see a rib of the bead on the back side of the groove.)

K. Clean bead with wire brush

L. Turn in completed work to your instructor for evaluation

M. Clean work area and store equipment and materials properly

PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

JOB SHEET #4 — LAY A BEAD WITH A FILLER ROD

I. Equipment and materials

A. Oxyacetylene welding unit with tip assembly

B. Flint lighter

C. Wrench

D. Leather gloves

E. Coveralls or other protective clothing

F. Shaded welding goggles or shaded face shield

G. Safety glasses

H. Wire brush

I. Pliers

J. Fire brick

K. One 1¼″ × 6″ 16-gauge mild-steel strip

L. Rod selection guide

M. Tip selection guide

N. Mild-steel filler rod

II. Procedure

(NOTE: Safety glasses or goggles should be worn in the shop at all times.)

A. Prepare metal for welding

B. Place metal in flat position on fire brick

C. Turn on oxyacetylene unit and set working pressure (See Job Sheet #1)

D. Light torch and adjust to a neutral flame (See Job Sheet #1)

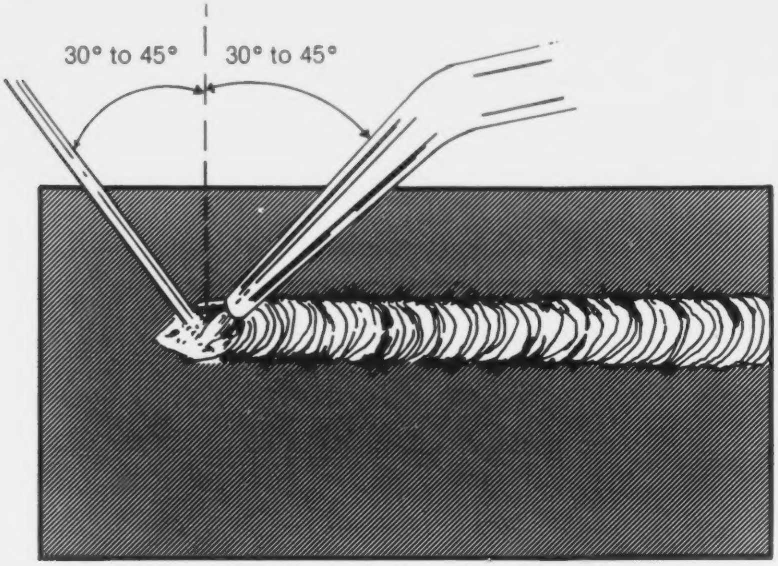
E. Holding inner cone 1/16 to 1/8 inch from surface of base metal, establish a molten puddle at one end in center of strip

JOB SHEET #4

F. Holding torch at a 30- to 45-degree angle down from vertical with tip pointed in direction of travel and holding rod at same angle in opposite direction and at front edge of puddle, begin bead, moving puddle forward with torch, keeping rod to front edge of puddle, and withdrawing rod as you move puddle forward (Figure 22)

(NOTE: Keep puddle the same size and shape throughout bead.)

FIGURE 22



G. Complete bead, maintaining rod and torch angle

H. Turn off torch (See Job Sheet #1)

I. Clean bead with wire brush

J. Turn in completed work to your instructor for evaluation

K. Clean work area and store equipment and materials properly

PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

JOB SHEET #5 — WELD A BUTT JOINT WITH A FILLER ROD

I. Equipment and materials

A. Oxyacetylene welding unit with tip assembly

B. Flint lighter

C. Wrench

D. Leather gloves

E. Coveralls or other protective clothing

F. Shaded welding goggles or shaded face shield

G. Safety glasses

H. Wire brush

I. Pliers

J. Fire brick

K. Rod selection guide

L. Tip selection guide

M. Mild-steel filler rod

N. Two 1¼" × 6" 16-gauge mild-steel strips

II. Procedure

(NOTE: Safety glasses or goggles should be worn in the shop at all times.)

A. Prepare metal for welding

B. Place metal in flat position on fire bricks, maintaining a 1/16-inch gap between strips

C. Turn on oxyacetylene unit and set working pressure (See Job Sheet #1)

D. Light torch and adjust to a neutral flame (See Job Sheet #1)

E. Tack weld strips at both ends of joint

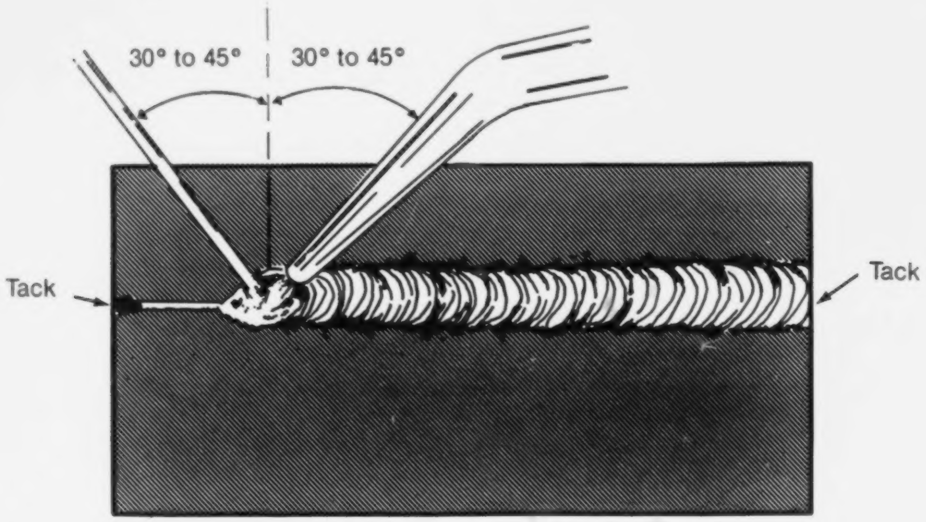
F. Holding inner cone 1/16 to 1/8 inch from surface of base metal, establish a molten puddle

JOB SHEET #5

G. Holding torch at a 30- to 45-degree angle down from vertical with tip pointed in direction of travel and holding rod at same angle in opposite direction and at front edge of puddle, begin bead, moving puddle forward with torch, keeping rod to front edge of puddle, and withdrawing rod as you move puddle forward (Figure 23)

(NOTE: Keep puddle the same size and shape throughout bead.)

FIGURE 23



H. Complete bead

I. Turn off torch (See Job Sheet #1)

J. Clean bead with wire brush and examine weld

(NOTE: When bead is examined from root side, a slight rib of the bead should be showing. This rib indicates good penetration.)

K. Turn in completed work to your instructor for evaluation

L. Clean work area and store equipment and materials properly

PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

JOB SHEET #6 — BRAZE A BUTT JOINT

I. Equipment and materials

A. Oxyacetylene welding unit with tip assembly

B. Flint lighter

C. Wrench

D. Leather gloves

E. Coveralls or other protective clothing

F. Shaded welding goggles or shaded face shield

G. Safety glasses

H. Wire brush

I. Pliers

J. Fire brick

K. Two 1¼" × 6" mild-steel strips, ⅛ inch thick

L. Rod selection guide

M. Tip selection guide

N. Bronze filler rod and brazing flux

II. Procedure

(NOTE: Safety glasses or goggles should be worn in the shop at all times.)

A. Clean and prepare metal for brazing

B. Place metal in flat position on fire brick, maintaining a 1/16- to ⅛-inch joint

C. Turn on oxyacetylene unit and set working pressure

(NOTE: See Job Sheet #1 for procedure; follow manufacturer's recommendations for proper working pressure.)

D. Light torch and adjust to a neutral or slightly oxidizing flame (See Job Sheet #1)

JOB SHEET #6

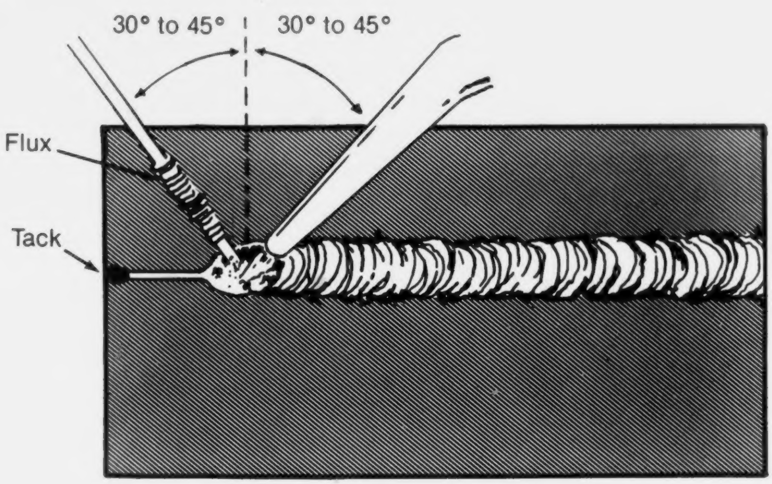
E. Preheat end of brazing rod and dip rod in flux, or use prefluxed rod

F. Braze tack metal in place, using filler metal

G. Slightly heat surface of weld area

H. Holding torch at a 30- to 45-degree angle from vertical with tip pointed in direction of travel and holding rod at same angle in opposite direction, heat base to a cherry red color, allowing molten bronze to spread along heated portion of joint (Figure 24)

FIGURE 24



I. Deposit filler metal over entire joint, maintaining torch and rod angles and slow rate of travel

J. Turn off torch (See Job Sheet #1)

K. Clean bead with wire brush

L. Turn in completed braze to your instructor for evaluation

M. Clean work area and store equipment and materials properly

PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

TEST

NAME ________________________ SCORE ____________

1. Match to their correct definitions terms associated with welding and brazing. Write the correct numbers in the blanks. Terms and definitions continue on the next page.

_____a. Inner white part of neutral flame

_____b. Material used to prevent, dissolve, or help remove oxides or other undesirable substances from filler metal in brazing or welding

_____c. Method in which base metals are heated so that a metal or metallic alloy (usually an alloy of lead and tin) melts and then cools to join base metals

_____d. Extent to which filler metal combines with base metal when welding; measured from surface of base metal

_____e. Light weld or braze used to hold base metals together

_____f. Warping or movement of metal due to intense concentration of heat

_____g. Metal rod that is melted and added to puddle to increase substance of bead

_____h. Portable container used to transport and store compressed gas

_____i. Mixture with metallic properties; composed of two or more elements of which at least one is a metal

_____j. Dangerous condition in which flame burns back inside torch body; characterized by a hissing sound and smoke and/or sparks emitted from torch tip

_____k. Alloy consisting chiefly of copper and tin; less common filler material used in brazing

_____l. Metal to be welded or brazed

1. Penetration
2. Base metal
3. Inner cone
4. Tack
5. Distortion
6. Flux
7. Flashback
8. Filler rod
9. Soldering
10. Cylinder
11. Alloy
12. Bronze

TEST

______m. Condition in which flame momentarily burns into tip; characterized by a loud snap or pop and the flame either going out or continuing to burn

______n. Process of forcing gases through hoses and torch to remove foreign materials or impurities

______o. Tool attached to cylinder; controls gas flow at a constant rate; has two gauges: one that shows pressure in cylinder, and one that shows working pressure going to torch

______p. Valve installed in top of cylinder to turn the flow of gas from cylinder on and off

______q. Alloy consisting chiefly of copper and zinc; most common filler material used in brazing

13. Regulator
14. Brass
15. Cylinder valve
16. Backfire
17. Purge

2. Identify the parts of the oxyacetylene welding and brazing equipment illustrated on the following page. Write the correct names in the corresponding blanks.

Acetylene pressure regulating screw
Oxygen cylinder valve
Safety chain
Oxygen cylinder
Acetylene cylinder
Acetylene cylinder valve
Oxy-gas welding and cutting goggles
Shaded face shield
Blowpipe handle (torch body)
Oxygen regulator

Acetylene regulator
Oxygen hose
Acetylene hose
Cylinder truck
Oxygen pressure regulating screw
Flint lighter
Oxygen torch valve
Acetylene torch valve
One-piece tube and tip

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

g. ______________________________

h. ______________________________

i. ______________________________

j. ______________________________

k. ______________________________

l. ______________________________

m. ______________________________

n. ______________________________

o. ______________________________

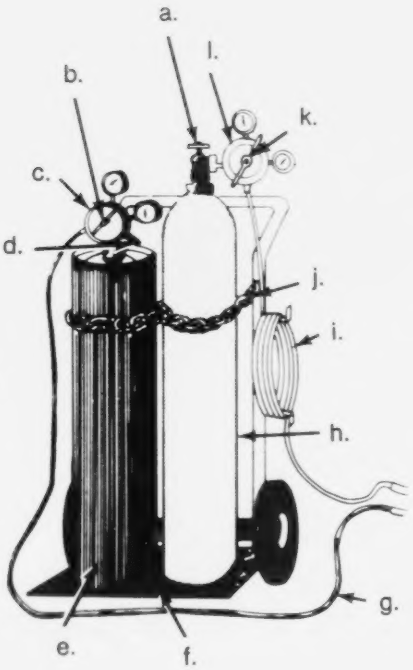
p. ______________________________

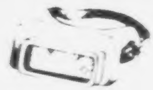
q. ______________________________

r. ______________________________

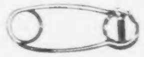
s. ______________________________

TEST

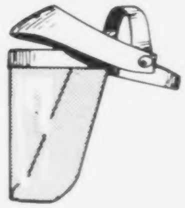

a.
l.
b.
k.
c.
d.
j.
i.
h.
g.
e.
f.



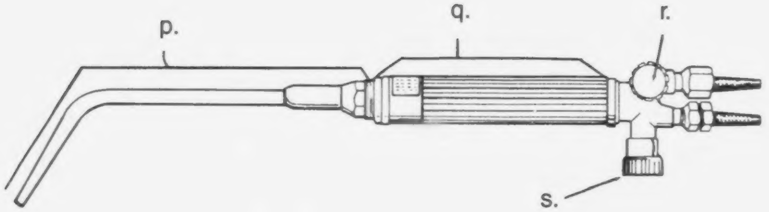
m.



n.



o.



TEST

3. State six safety precautions for handling oxyacetylene welding and brazing equipment.

a. ____

____

b. ____

____

c. ____

____

d. ____

____

e. ____

____

f. ____

____

4. Match types of oxyacetylene welding and brazing flames to their correct characteristics. Write the correct numbers in the blanks.

_____a. Contains excess of oxygen in flame; has short inner cone, and makes whistling sound; oxidizes metal, causing it to become brittle

_____b. Contains excess of acetylene gas in flame; burns extra acetylene, causing carbon to be introduced into weld, which makes metal brittle

_____c. Burns equal parts of oxygen and acetylene; has clear, well-defined, white inner cone; does not show acetylene feather

1. Carburizing flame
2. Neutral flame
3. Oxidizing flame

5. Distinguish between definitions of oxyacetylene welding and oxyacetylene brazing. Write an "X" in the blank before the definition of oxyacetylene welding.

_____a. Method in which an oxyacetylene flame heats, but does not melt, base metals so that filler metal melts to join base metals through adhesion

_____b. Method in which a high-temperature oxyacetylene flame melts and joins base metals, or base metals and filler metal, through fusion

TEST

6. List properties of a good weld.

   a. ____________________

   b. ____________________

   c. ____________________

   d. ____________________

   e. ____________________

7. List factors that determine a good weld.

   a. ____________________

   b. ____________________

   c. ____________________

   d. ____________________

8. List factors to consider when selecting proper welding tip.

   a. ____________________

   b. ____________________

9. List factors to consider when selecting proper welding rod.

   a. ____________________

   b. ____________________

   c. ____________________

10. Discuss the advantages of brazing.

    ____

    ____

    ____

    ____

    ____

    ____

TEST

11. List characteristics of a good braze.

    a. ______________________________

    b. ______________________________

    c. ______________________________

12. List factors that determine a good braze.

    a. ______________________________

    b. ______________________________

    c. ______________________________

    d. ______________________________

    e. ______________________________

13. Match incorrect flame temperatures to their effects on flow of brazing filler metal. Write the correct numbers in the blanks.

    ______a. Molten filler metal tends to boil and form little balls

    ______b. Filler metal forms into drops

    1. Flame temperature is too hot

    2. Flame temperature is too cool

(NOTE: Test item 14 lists the job sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

14. Demonstrate the ability to

    a. Turn on, light and adjust torch, and turn off oxyacetylene equipment.

    b. Lay a bead without a filler rod.

    c. Construct a corner weld without a filler rod.

    d. Lay a bead with a filler rod.

    e. Weld a butt joint with a filler rod.

    f. Braze a butt joint.

PLAN PROJECT CONSTRUCTION
UNIT IV

TEST

NAME ________________________________ SCORE ______________

1. State questions to ask yourself when considering a construction project.

   a. ____

   b. ____

   c. ____

   d. ____

   e. ____

2. Match to their correct definitions terms associated with reading and drawing project plans. Write the correct numbers in the blanks.

   ______a. Rough drawing representing chief features of an object to be built

   ______b. Detailed working plan drawn to scale and showing all information and dimensions necessary to build an object

   ______c. Reproduction of an engineer's drawing

   ______d. Conventional lines and figures illustrating actual sizes and distances of objects and spaces represented

   ______e. Illustration showing three or more sides of an object

   ______f. Proportion between two sets of dimensions, such as that between a drawing and the actual object

   1. Engineer's drawing
   2. Sketch
   3. Dimension
   4. Blueprint
   5. Scale
   6. Pictorial drawing

3. Match principal parts of a drawing to their correct descriptions. Write the correct numbers in the blanks.

   ______a. Contains different views of the object to be built, dimensions, welding symbols, notes, and other information

   ______b. Provides itemized list of number, kind, and dimensions of each piece of material needed to construct an object

   ______c. Contains basic information about the drawing

   1. Body
   2. Title block
   3. Bill of materials

TEST

4. Match basic elements in the body of a drawing to their correct descriptions. Write the correct numbers in the blanks.

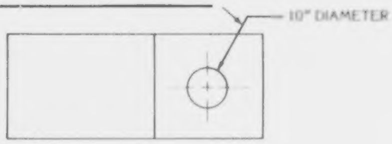
_____a.	Show size and location of various segments of object	1. Lines
_____b.	Show shape and dimensioning of object	2. Dimensions
_____c.	Explain details of construction not shown by lines and dimensions	3. Notes

5. Identify the basic lines used in the body of a drawing. Write the correct names in the blanks.

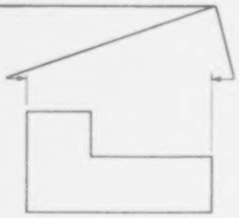
Border line
Object line
Hidden line
Dimension line
Extension lines

Center line
Leader line
Cutting-plane lines (section lines)
Break line
Phantom line

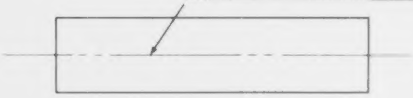
a. ______________________________



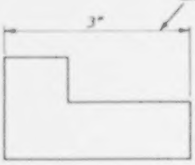
b. ______________________________



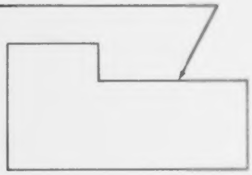
c. ______________________________



d. ______________________________



e. ______________________________



PERFORM OXYACETYLENE WELDING AND BRAZING
UNIT III

ANSWERS TO TEST

1. a. 3
   b. 6
   c. 9
   d. 1
   e. 4
   f. 5
   g. 8
   h. 10
   i. 11
   j. 7
   k. 12
   l. 2
   m. 16
   n. 17
   o. 13
   p. 15
   q. 14

2. a. Oxygen cylinder valve
   b. Acetylene pressure regulating screw
   c. Acetylene regulator
   d. Acetylene cylinder valve
   e. Acetylene cylinder
   f. Cylinder truck
   g. Acetylene hose
   h. Oxygen cylinder
   i. Oxygen hose
   j. Safety chain
   k. Oxygen pressure regulating screw
   l. Oxygen regulator
   m. Oxy-gas welding and cutting goggles
   n. Flint lighter
   o. Shaded face shield
   p. One-piece tube and tip
   q. Blowpipe handle (torch body)
   r. Oxygen torch valve
   s. Acetylene torch valve

3. Answer should include any six of the following

   a. Before attaching regulators, blow out cylinder valve by opening and closing valve quickly
   b. Before opening cylinder valves, check to make sure that adjusting screws on regulators are loose
   c. Stand to one side of regulator when opening cylinder valve
   d. Open cylinder valve slowly to prevent explosions
   e. Do not use or compress acetylene (in free state) at pressures greater than 15 pounds per square inch (psi)
   f. Purge oxygen and acetylene passages individually before lighting torches
   g. Light acetylene before opening oxygen valve on torch
   h. Never use oil or grease on regulators, torches, fittings, or other equipment in contact with oxygen

ANSWERS TO TEST

- i. Never use oxygen as a substitute for compressed air
- j. Keep combustible materials away from work areas
- k. Have CO_2 or dry-powder fire extinguisher available
- l. Test connections for leaks with Ivory soap suds, paintbrush, and water
- m. Always use flint lighter to light torch
- n. Always wear leather welding gloves
- o. Always wear oxy-gas welding goggles
- p. Wear protective clothing to cover all parts of the body
- q. Never weld on containers that have been used for storing combustible materials
- r. Never weld on concrete
- s. Always weld at least 5 feet away from cylinders
- t. Always operate torch in a well-ventilated area
- u. Never leave a burning torch unattended
- v. Always place steel caps on cylinders when they are being moved or are in storage
- w. Shut off cylinder valves when not in use to reduce the possibility of leakage and strain on equipment
- x. Turn off acetylene torch valve first so flame will go out immediately
- y. Always support or store cylinders in an upright position
- z. Keep long hair tied back

4. a. 3
   b. 1
   c. 2

5. b

6. a. Straight, consistent bead
   b. Slightly convex crown
   c. Clean appearance
   d. Good penetration
   e. Good fusion

7. a. Proper flame adjustment
   b. Proper torch position
   c. Proper flame-movement pattern
   d. Proper welding rod

8. a. Thickness of metal to be welded
   b. Size of welding rod to be used

9. a. Thickness of metal to be welded
   b. Properties of metal to be welded
   c. Size of welding tip to be used

ANSWERS TO TEST

10. Discussion should include the following
    a. Provides a stronger joint than soldering
    b. In certain instances, provides as strong a joint as welding
    c. Has less effect on heat treatment of base metal than welding
    d. Creates less warpage of base metals than welding
    e. Provides mechanical strength and pressure-proof joints
    f. Makes it possible to join dissimilar metals

11. a. Good penetration of filler metal through joint
    b. Good adhesion of filler metal to base metal
    c. Very little or no melting of base metal

12. a. Clean base metal
    b. Proper joint fit-up
    c. Proper support for base metals
    d. Proper filler metal and flux
    e. Proper flame adjustment

13. a. 1
    b. 2

14. Performance skills evaluated to the satisfaction of the instructor

PLAN PROJECT CONSTRUCTION
UNIT IV

UNIT OBJECTIVE

After completing this unit, the student should be able to read and interpret a drawing, determine a bill of materials, determine the cost of a project, and complete a plan for a project. The student will show this ability by completing the assignment sheets and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. State questions to ask yourself when considering a construction project.
2. Match to their correct definitions terms associated with reading and drawing project plans.
3. Match principal parts of a drawing to their correct descriptions.
4. Match basic elements in the body of a drawing to their correct descriptions.
5. Identify basic lines used in the body of a drawing.
6. Match to their correct descriptions types of dimensions used in the body of a drawing.
7. Identify the major pictorial views used in the body of a drawing.
8. Distinguish between the description of a cutting bill-of-materials and the description of a shopping bill-of-materials.
9. State facts you need to know about each item listed on a cutting bill-of-materials.
10. Label the facts you need to know about each item listed on a shopping bill-of-materials.
11. Match terms associated with material descriptions to their correct definitions.
12. Match units of measure to the lumber products they measure.
13. Match units of measure to the construction materials they measure.
14. State the steps for computing board feet, square feet, and running feet.
15. Match types of wood fasteners to their correct uses.
16. Read and interpret drawings.

OBJECTIVE SHEET

17. Draw a three-view sketch.
18. Calculate board feet and the cost of lumber sold by the board foot.
19. Calculate the cost of materials other than lumber.
20. Determine cutting bill-of-materials.
21. Determine total cost of a project.
22. Complete plans for a project.

PLAN PROJECT CONSTRUCTION
UNIT IV

SUGGESTED ACTIVITIES

I. Unit contents

  A. Objective sheet

  B. Suggested activities

    1. Supplements

      a. Supplement #1 — Planning a Project

      b. Supplement #2 — Instructions for Playing Concentration Game with Abbreviations Used on Drawings

      c. Supplement #3 — Basic Welding Symbols

      d. Supplement #4 — Grades of Softwood Lumber

      e. Supplement #5 — Plywood Fact Sheet

      f. Supplement #6 — Nail Fact Sheet

      g. Supplement #7 — Wood-Screw Fact Sheet

      h. Supplement #8 — Glue Fact Sheet

    2. Transparency masters

      a. TM #1 — Basic Welding Symbols

      b. TM #2 — Basic Lines Used in Drawing and Sketching

      c. TM #3 — Basic Lines Used in Drawing and Sketching (Continued)

      d. TM #4 — Uses of Lines on a Drawing

      e. TM #5 — Types of Dimensions on a Drawing

      f. TM #6 — Converting a Pictorial View into a Three-Sided View

      g. TM #7 — Shopping Bill-of-Materials

      h. TM #8 — Types of Nails

      i. TM #9 — Types of Nails (Continued)

SUGGESTED ACTIVITIES

j. TM #10 — Types of Wood Screws

k. TM #11 — Types of Bolts

C. Information sheet

D. Assignment sheets

1. Assignment Sheet #1 — Complete a Checklist for Planning a Project for Construction
2. Assignment Sheet #2 — Read and Interpret Drawings
3. Assignment Sheet #3 — Label Lines Used in a Drawing
4. Assignment Sheet #4 — Draw a Three-View Sketch
5. Assignment Sheet #5 — Calculate Board Feet and the Cost of Lumber Sold by the Board Foot
6. Assignment Sheet #6 — Calculate the Cost of Materials Other Than Lumber
7. Assignment Sheet #7 — Determine Cutting Bill-of-Materials
8. Assignment Sheet #8 — Determine Total Cost of a Project
9. Assignment Sheet #9 — Complete Plans for a Project

E. Answers to assignment sheets

F. Test

G. Answers to test

II. Instructor's guide

A. Obtain materials to supplement unit.

1. Films

(NOTE: The following films are loaned without charge and should be returned prepaid and insured. Please request first available picture booking date or give preferred date and two alternate ones.)

a. *Miracle in Wood.* Color, 27 minutes, American Plywood Association. Available from American Plywood Association, 1119 A Street, Tacoma, Washington, 98401

(NOTE: The early Egyptians and Chinese were the first to use wood in the form that we know as "plywood." This film traces the evolution of plywood into one of today's most versatile materials.)

SUGGESTED ACTIVITIES

b. *In Search of the Last Redwood.* Color, 25 minutes, California Redwood Association. Available from California Redwood Association, One Lombard Street, San Francisco, California 94111.

(NOTE: This film shows the vast commercial redwood timber forests including growth, harvesting, and protecting the world's tallest tree species to assure there will never be a "last redwood.")

c. *Particle Board — Out of Sight and Underfoot.* Color, 20 minutes, National Particle Board Association. Available from National Particle Board Association, 2306 Perkins Place, Silver Springs, Maryland 20910.

(NOTE: This film tells the story of particle-board underlayment in modern construciton.)

2. Booklets

a. *The Story of Particle Board.* Illustrated, 23 pages. Available from the National Particle Board Association, 2306 Perkins Place, Silver Springs, Maryland 20910.

(NOTE: This booklet tells how particle board was invented, how the manufacture of particle board has progressed to date, how particle board is used, and how it is made.)

b. *Beautiful Woods.* Available from Frank Paxton Lumber Company, 1815 South Agnew Avenue, Box 82215, Oklahoma City, Oklahoma 73148, or from School Shop Equipment and Supplies, Paxton/Patterson, 5719 West 65th Street, Chicago, Illinois 60638.

(NOTE: This booklet tells how lumber is grown and manufactured, how wood is finished, the characteristics of glues used with wood, the grades of lumber [softwood and hardwood], how to measure lumber, what plywood is, the characteristics of woods, and the stories of the better-known woods.)

3. Transparencies and competency profiles

(NOTE: Transparencies and competency profiles for this book are available from the Oklahoma State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

B. Make transparencies and additional copies of supplements, if needed.

SUGGESTED ACTIVITIES

C. Introduce unit.

SUGGESTION:

- Show the students the headache rack plans in Supplement #1 and point out the benefits of developing plans for a project, reading the drawings carefully, determining the materials needed, and then determining the cost. Compare building a project with no plans with baking a cake with no recipe.

D. Provide students with objective sheet.

E. Discuss unit and specific objectives.

F. Provide students with information and assignment sheets.

1. Use Information Sheet, Section I to discuss questions a student should ask when considering a construction project.

   SUGGESTIONS:

   - Discuss Assignment Sheet #1, explaining to students that if a significant number of questions are answered no, the project may well be inappropriate.

   - Have students complete Assignment Sheet #1.

   - Discuss Supplement #1.

   - Have students complete Supplement #1.

2. Use Information Sheet, Section II to discuss terms associated with reading and drawing project plans. Emphasize the importance of defining terms for common understanding.

3. Use Information Sheet, Section III to discuss the principal parts of a drawing.

   SUGGESTIONS:

   - Have students study the drawing in the information sheet and point out the types of information given in the title block and bill of materials; stress the skills needed to read the body of the drawing.

   - Discuss Part I of Assignment Sheet #2.

   - Have students complete Part I of Assignment Sheet #2.

4. Use Information Sheet, Sections IV through VII to discuss the elements in the body of a drawing and the basic lines, types of dimensions, and pictorial-drawing views used in the body of a drawing.

SUGGESTED ACTIVITIES

SUGGESTIONS:

- Use Transparencies #1 through #6 to illustrate your discussion.
- Stress that the body of the drawing will also contain symbolic information such as welding symbols and abbreviations. If students are interested, use Supplements #2 and #3 to discuss the welding symbols and abbreviations used in drawings.
- Discuss Parts II and III of Assignment Sheet #2, and all of Assignment Sheets #3 and #4.
- Have students complete Parts II and III of Assignment Sheet #2 and all of Assignment Sheets #3 and #4.

5. Use Information Sheet, Section VIII through X to discuss the descriptions of a cutting bill-of-materials and a shopping bill-of-materials, facts you need to know about each item on a cutting bill-of-materials, and the components of a shopping bill-of-materials.

SUGGESTIONS:

- Stress that a prepared engineer's drawing contains a complete bill of materials that may be used as a cutting bill-of-materials; however, if a student has made a drawing or sketch, he or she will have to prepare a cutting bill-of-materials to save time and money when cutting or sawing materials for a project.
- Explain to students that a shopping bill-of-materials is used to calculate the cost of the project prior to construction in order to get a realistic cost estimate.
- Help students see that in order to be able to write both cutting and shopping bill-of-materials that they must be familiar with the terms used to describe materials and the units of measure, grades, and classification of materials. In addition, to complete a shopping bill-of-materials, they must be able to calculate the cost of those materials.
- Show students Transparency #7 to illustrate a shopping bill-of-materials.

6. Use Information Sheet, Section XI through XV to discuss the skills needed to write cutting and shopping bills-of-materials: terms associated with material descriptions; units of measure for lumber and other materials; computing board feet, square feet, and running feet; and uses of wood fasteners.

SUGGESTIONS:

- Only very basic terms and units of measure are discussed in the information sheet; show Transparencies #8 through #11 and use Supplements #4 through #8 for more complete discussion of the terms and units of measure for softwood lumber, plywood, nails, wood screws, bolts, and glue.

SUGGESTED ACTIVITIES

- Discuss Assignment Sheets #5 and #6; have students complete Assignment Sheets #5 and #6 to give them practice in computing board feet, square feet, running feet, and the cost of items sold in these quantities.

- Use microcomputer software developed for teaching students to calculate board.

  EXAMPLE: "Unit VIII - Program 13, Calculating Board Feet (Job Sheet #1)" in *Microcomputer Applications in Agriculture*. Curriculum available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, Stillwater, Oklahoma 74074.

- Emphasize that only the most common fasteners (nails, screws, bolts) are listed in the information sheet. Many other types are available. Also, discuss how glue is used as a wood fastener.

7. Discuss Assignment Sheets #7 through #9.

8. Have students complete Assignment Sheets #7 through #9.

G. Give test.

H. Critique test and discuss in class.

I. Reteach if necessary.

J. Complete appropriate sections of competency profiles.

III. Unit references

A. Armstrong, Ivan. *VICA Shop Projects*. Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1976.

B. *Beautiful Woods*. Chicago, Illinois: Frank Paxton Lumber Company, 1974.

C. Braker, Clifton R. (Pete), and Bob Patton. *Vocational Agriculture II: A Curriculum Guide*. Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1975.

D. Hamilton, William H., and Arthur R. Mann. *Planning Project Construction*. St. Paul, Minnesota: Hobar Enterprises, Inc., 1981.

E. Hendrix, L. J. "Bud". *Fundamentals of Carpentry*. Stillwater, Oklahoma: State Department of Vocational and Technical Ecuation and the Associated General Contractors of America, 1985.

F. *How to Specify and Buy Industrial Arts Lumber and Plywood*. Chicago, Illinois: Frank Paxton Lumber Company, 1974.

SUGGESTED ACTIVITIES

G. Hutson, Jane, et. al. *Microcomputer Applications in Agriculture.* Stillwater, Oklahoma: Mid-America Vocational Curriculum Consortium, Inc., 1984.

H. Patton, Bob. *FFA Shop Projects.* Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1973.

I. Shinn, Glen C., and Curtis R. Weston. *Working in Agricultural Mechanics.* New York: McGraw-Hill Book Company, 1978.

J. Smith, Eddie, Clifton R. (Pete) Braker; and Bob Patton. *Agricultural Mechanics.* Stillwater, Oklahoma: State Department of Vocational and Technical Education/ Curriculum and Instructional Materials Center, 1977.

K. South, Pamela. *Basic Blueprint Reading.* Mississippi State, Mississippi: Research and Curriculum Unit for Vocational-Technical Education, College of Education, Mississippi State University, December, 1983.

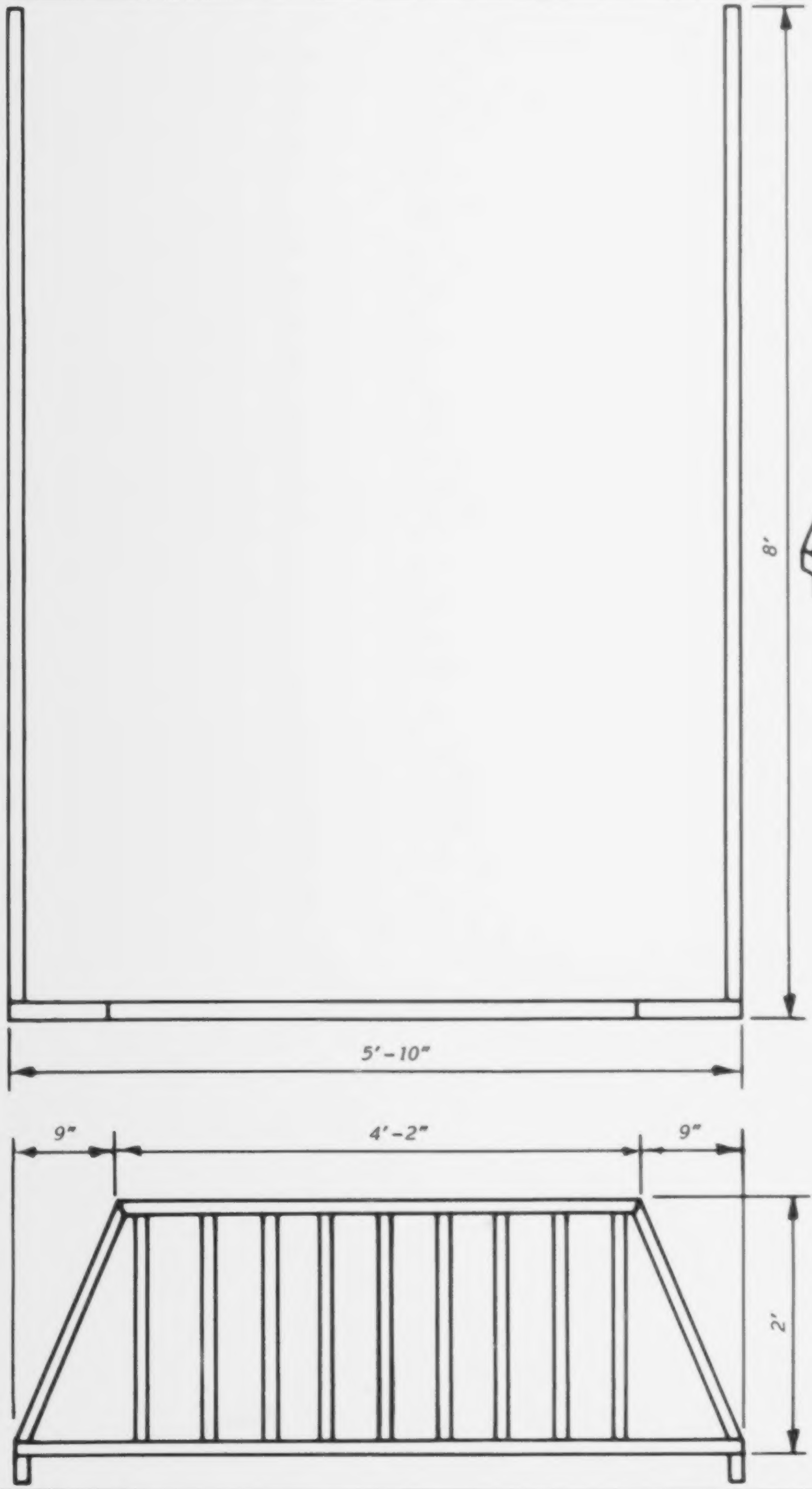
L. Whitaker, James H. *Agricultural Buildings and Structures.* Reston, Virginia: Reston Publishing Company, 1979.

SUGGESTED ACTIVITIES

SUPPLEMENT #1 — PLANNING A PROJECT

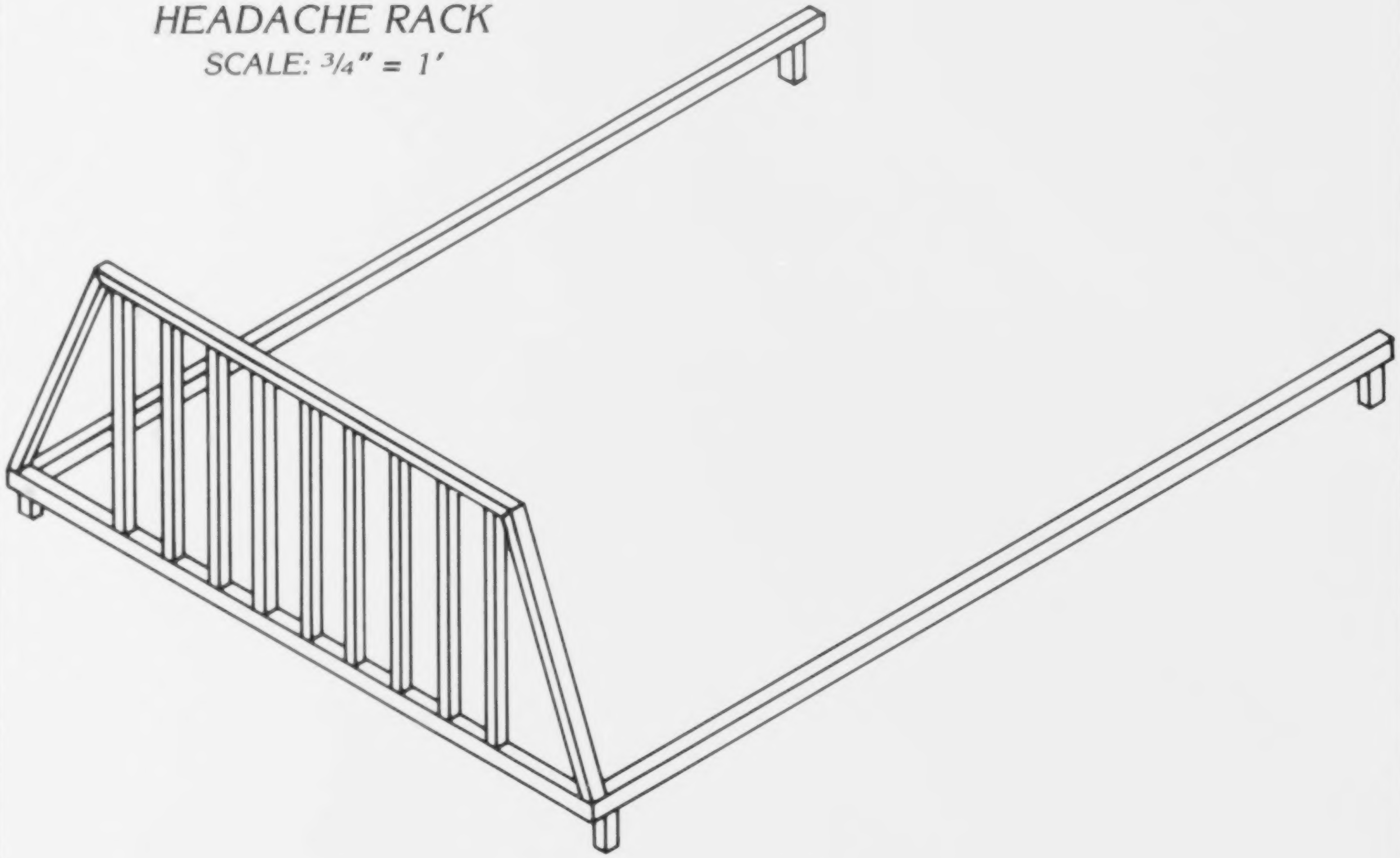
Assume that you have been assigned to construct the project in the plan on the following page. What questions do you need to ask yourself before beginning construction? Write your questions on the blanks provided below.

SUPPLEMENT #1



HEADACHE RACK

SCALE: 3/4" = 1'



BILL OF MATERIALS
2 PIECES OF 1 1/2" SQUARE TUBING 8' LONG
1 PIECE OF 1 1/2" SQUARE TUBING 5' - 10" LONG
9 PIECES OF 1" SQUARE TUBING 1' - 10" LONG
2 PIECES OF 1" SQUARE TUBING 2' - 8" LONG
1 PIECE OF 1" SQUARE TUBING 4' - 2" LONG
4 PIECES OF 1 1/2" SQUARE TUBING 4" LONG

DRAWN BY: JOHN McEACHERN

CURRICULUM AND INSTRUCTIONAL MATERIALS CENTER
STATE DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION
STILLWATER, OKLAHOMA

SUGGESTED ACTIVITIES

SUPPLEMENT #2 — INSTRUCTIONS FOR PLAYING CONCENTRATION GAME WITH ABBREVIATIONS USED ON DRAWINGS

Purpose

Concentration provides the opportunity to eliminate the boredom of repetition in drilling students to learn the basics. It is an enjoyable classroom activity that allows students to match closely related terms and information.

(NOTE: Concentration is a classroom alternative that can be improvised with a very minimal investment of dollars and cents. The basic board can be personalized to address many group and individual learning needs in nearly every subject area.)

Preparation

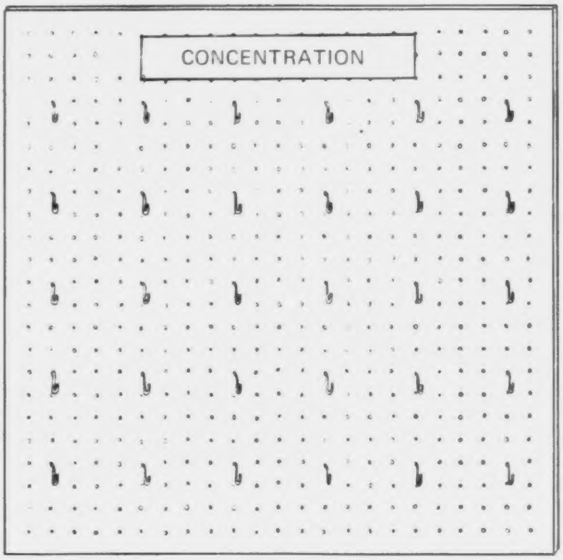
A. Gather the following materials to construct a basic Concentration board

Pegboard, 24" × 30"
Pegboard hooks, approximately 30 to 36
Poster board or index cards, all one color
Spray paint, optional
Scissors
Glue
Hole punch

B. Paint the pegboard if desired, and allow to dry

C. Write the word CONCENTRATION on a piece of poster board and glue to the top of the pegboard

D. Position the pegboard hooks



SUPPLEMENT #2

E. Cut 3" × 5" cards from colorful poster board (cards should all be the same color), or use unlined index cards

F. Number one side of each card from 1 to 36, or adapt to twice the actual number of terms, items, and so on that the student will identify

G. Shuffle the numbered cards to mix the numbers, and then write the abbreviations and definitions on the cards

(NOTE: Once the cards are made, they can double as flash cards or playing cards to involve students in pairs.)

H. Punch a hole in the top of each card, and place the cards on the hooks in numberical sequence, with the numbered side showing

Play

A. The beginning student or team selects two numbers

EXAMPLE: 2 and 27

B. If the abbreviations and definition cards match, the student or team earns a point, or has the opportunity to give a definition to earn a point

C. If the cards match and the point is earned, the cards that match should remain turned out, with their numbers now facing the board

D. If the cards do not match, they are returned to their original playing position with numbers facing out, and the turn goes to the opposition

E. The game continues until the backs of all cards are revealed and matched

F. The student or team that provides the highest number of matches (points) wins the game

(NOTE: The instructor may want to present a reward or a token of accomplishment to the winning student or team.)

SUPPLEMENT #2

Abbreviations and definitions to use in Concentration game

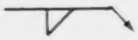
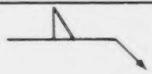
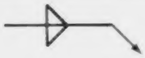
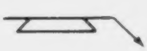
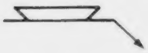
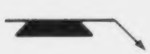
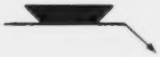
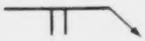
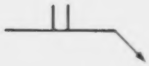
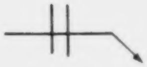
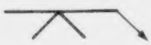
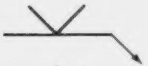
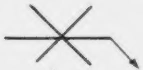
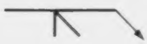
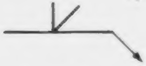
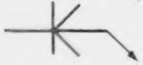
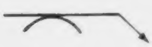
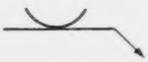
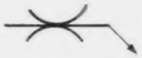
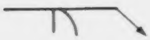
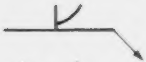
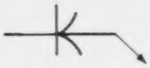
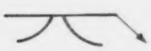
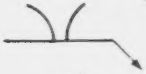
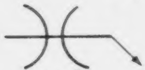
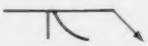
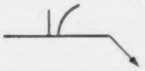
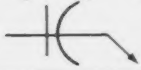
BR#	Brass, SAE#	I	I beam
BRO#	Bronze, SAE#	ID	Inside diameter
CBORE	Counterbore	IN,"	Inch(es)
CC	Center to center	MAL I	Malleable iron
CHFR	Chamfer	NC	National course
CI	Cast iron	NF	National fine
CIR	Circular	NO, #	Number
CRS	Cold-rolled steel	NTS	Not to scale
CS	Cast steel	OC	On center
CSK	Countersink	OD	Outside diameter
CYL	Cylinder	R, RAD	Radius
DEG,°	Degree(s)	REQ'D	Required
DIA	Diameter	SQ	Square
F, FIN	Finish	STD	Standard
FAO	Finish all over	STL	Steel
FS	Full size	STL C	Steel casing
FSD	Full-size detail	THD(S)	Thread(s)
GA	Gauge	USS	United States Standard
GI	Galvanized iron	WI	Wrought iron
HEX	Hexagon		

SUGGESTED ACTIVITIES

SUPPLEMENT #3 — BASIC WELDING SYMBOLS

Much practice is necessary for developing skill in reading and interpreting the basic welding symbols used in drawings. Study the chart below on basic welding symbols, and then complete the chart on the following page by drawing the correct welding symbol for each weld type.

Basic welding symbols

Weld type	Arrow side	Far side	Both sides
Fillet			
Plug or slot			Not used
Arc seam, arc spot			Not used
Butt or groove, square			
V			
Bevel			
U			
J			
Flare V			
Flare bevel			

Supplementary symbols

Weld all around	Field weld	Flush contour	Convex contour
○	●	—	⌒

SUPPLEMENT #3

Basic welding symbols

Weld type	Arrow side	Far side	Both sides
Fillet			
Plug or slot			Not used
Arc seam, arc spot			Not used
Butt or groove, square			
V			
Bevel			
U			
J			
Flare V			
Flare bevel			

Supplementary symbols

Weld all around	Field weld	Flush contour	Convex contour

SUGGESTED ACTIVITIES

SUPPLEMENT #4 — GRADES OF SOFTWOOD LUMBER

Most commercial lumber available in lumber yards is softwood and is graded under the American Softwood Lumber Standards. In some areas of the United States, a number of native woods may be purchased from local sawmills. The quality and seasoning vary greatly, and finish is to order. The cost of this lumber, often used rough-cut, is somewhat less than yard lumber. Many species are satisfactory for boards and some for light framing; however, for structural purposes, lumber should be stamped with an approved code.

Six United States agencies plus a Canadian agency have established, under provisions of the American Softwood Lumber Standard, grades for lumber that have been approved by the Board of Review. The following is a typical grading system.

Grades of softwood lumber

Classification	Grade	Description and use
Dimension	*Structural light framing* (2" to 4" thick, 2" to 4" wide)	For engineered application where higher bending-strength ratios are needed.
2" to 5" thick 2" or more wide	Select structural	Use where high strength and stiffness and good appearance are needed.
	No. 1	Use about the same as SEL STR, slightly lower in quality.
	No. 2	Recommended for most general construction.
	No. 3	Appropriate for use in general construction where appearance is not generally a factor.
	Light framing (2" to 4" thick, 2" to 4" wide)	Provides good appearance at lower design levels where high strength and high appearance are not needed.
	Construction	Recommended and widely used for general construction.
	Standard	Customarily used for the same purposes or in conjunction with Construction grade; a little lower in quality.
	Utility	Used for studding, blocking, plates, bracing, and rafters where a combination of good strength and economical construction is desired.
	Economy (2" to 4" thick, 2" and wider)	Suitable for crating, bracing, and temporary construction.
	Studs (2" to 4" thick, 2" to 6" wide)	Only one grade.
	Stud	Suitable for all stud uses including use in load-bearing walls.
	Structural joists and planks (2" to 4" thick, 5" and wider)	For engineering applications requiring lumber 5" and wider.
	Select structural	Recommended for use where high strength and stiffness and good appearance are required.
	No. 1	About the same as SEL STR, somewhat lower in quality.
	No. 2	Recommended for most general construction use.
	No. 3	Appropriate for use in general construction where appearance is not a factor.

SUPPLEMENT #4

Grades of softwood lumber (continued)

Classification	Grade	Description and use
Dimension	*Appearance framing* (2" to 4" thick, 2" and wider) A	For exposed use in housing and light construction where knotty-type lumber of high strength and finest appearance is required. Only one grade.
Posts and timbers 5"×5" and larger; width not more than 2" greater than thickness	Select structural	Used for columns, posts, and struts in heavy construction such as warehouses and docks where superior strength is required.
	No. 1	Use the same as SEL STR where appearance is less exacting, but where high strength is required. Slightly lower quality.
	No. 2	Recommended for general construction.
	No. 3	Recommended for rough general construction.
Boards Up to 1½" thick, 2" and wider	Select merchantable (1 common)	Primarily for use in housing and light construction where it is exposed as paneling, shelving, and other uses where a knotty-type of lumber with finest appearance is required.
	Construction (2 common)	Recommended for subfloors, roof and wall sheathing, and concrete forms.
	Standard (3 common)	Used more widely than other grades for general construction. Used for same purposes as Construction, lower in quality.
	Utility (4 common)	Combines usefulness and low cost for general construction.
	Economy (5 common)	Suitable for low-grade sheathing, crating, bracing, and temporary construction.
Finish 2" and thinner 2" and wider	C and BTR	Graded for appearance. Highest-type product from the clear section of the log. Recommended for interior trim and cabinet work with a natural finish.
	D	Suitable where requirements for finishing are less exacting; paint finish.

Supplement #4 adapted with permission of Prentice-Hall, Inc., from *Agricultural Buildings and Structures*, by James H. Whitaker, Reston Publishing Company, 1979. Table, Grades of Softwood Lumber, used with permission of Western Wood Products Association.

SUGGESTED ACTIVITIES

SUPPLEMENT #5 — PLYWOOD FACT SHEET

Where was plywood invented?

Plywood was invented in Egypt during the time of the pharoahs. In fact, over 1500 years before the birth of Christ, perfect specimens of veneered furniture were being made by Egyptian artisans. The ancient Babylonians, Assyrians, and Romans further advanced the art.

What is plywood?

Plywood is a fabricated wood product made of layers of veneer joined with adhesive (glue). The grain of the wood in each plywood layer (ply) is ordinarily at a right angle to the grain of the adjoining layer, making plywood, pound for pound, stronger than steel.

What are the advantages of using plywood in construction projects?

Because of the way it is constructed, plywood is very strong—stronger even than solid wood. Plywood is also less expensive than solid wood and is easier to work with because its larger size will cover a larger area. But strength, low cost, and convenience are not its only virtures—plywood is also beautiful. Plywood is available in specially matched veneers that are used to add beauty to fine construction projects.

What is a veneer?

A *veneer* is a thin (1/100- to 1/4-inch thick) sheet of wood that has been sliced or peeled from a log.

What are the three principal methods of veneer manufacturer?

Rotary cutting. In rotary cutting, a log is put on a lathe and revolved against a stationary knife, causing the veneer to be unwound from the log like paper is unwound from a roll. See Table A.

Flat slicing. In flat slicing, a log is halved and sliced parallel to the axis of the tree. Then one-half of the log is clamped onto a slicer that moves up and down against a stationary knife. The knife cuts the veneer from the log on each downstroke. See Table A.

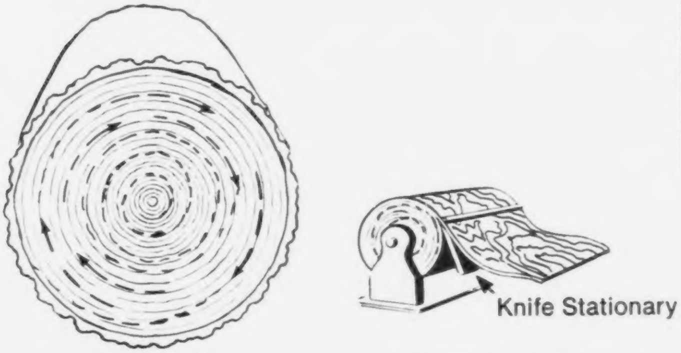
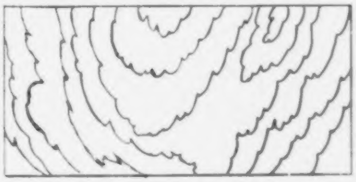
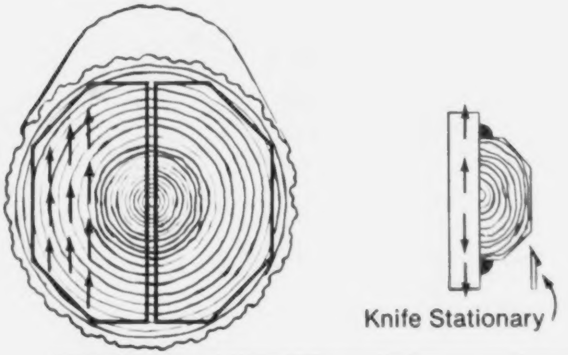
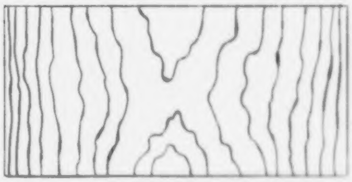
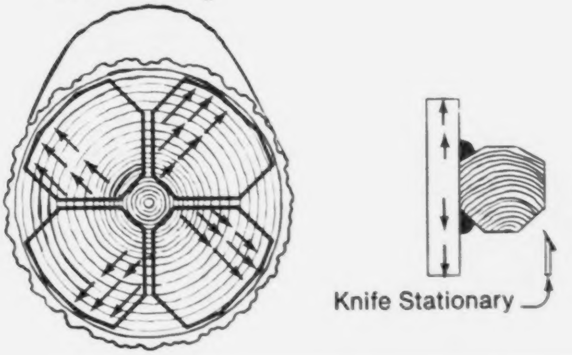
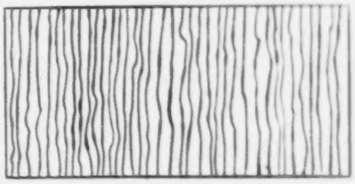
Quarter slicing. In quarter slicing, a log is quartered and sliced radially to the growth of the tree. Then the log quarter is clamped onto a slicer that moves up and down against a stationary knife. The knife cuts the veneer from the log. See Table A.

How are the plys arranged in plywood?

A *ply* is one of the odd number (3, 5, 7, etc.) of veneer sheets forming a piece of plywood. Plies are selected in pairs and placed symmetrically on both sides of a core material; this arrangement minimizes internal stress. The greater the number of plies, the less tendency of the sheet to twist.

SUPPLEMENT #5

TABLE A: Three principal methods of veneer manufacture

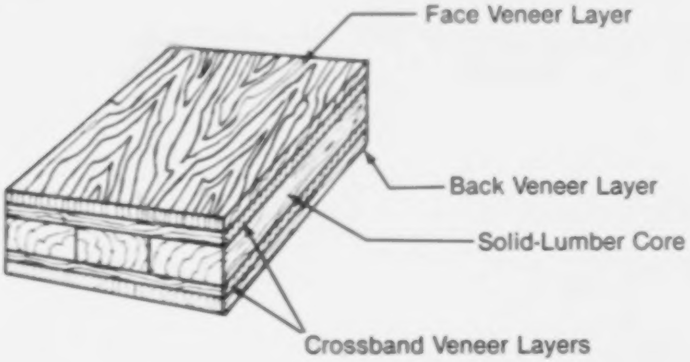
Method	Grain characteristics
Rotary cutting  Knife Stationary	 Rotary
Flat slicing  Knife Stationary	 Flat-Sliced
Quarter slicing  Knife Stationary	 Quarter-Sliced

SUPPLEMENT #5

What are the principal methods of plywood construction?

Lumber-core construction. In lumber-core construction, a ½-inch-thick edge-glued solid-lumber core is sandwiched between perpendicular-grained crossband veneer layers, and then face and back veneer layers are attached to the crossband layers. See Figure A. Such a plywood panel is strong and free from warps, and the edge can be shaped to resemble solid-wood construction. Therefore, lumber-core plywood is used in fine work such as cabinets and furniture.

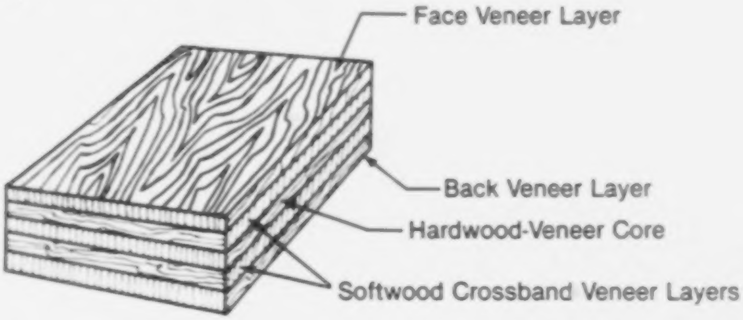
FIGURE A


Face Veneer Layer
Back Veneer Layer
Solid-Lumber Core
Crossband Veneer Layers

Veneer-core construction. In veneer-core construction, a five-ply hardwood veneer core is sandwiched between softwood crossband veneer layers, and then a hardwood face and back are attached to the softwood veneer layers. See Figure B.

Veneer-core plywood is less expensive to produce than lumber-core plywood and it is almost as stable as lumber-core plywood. However, the veneer-core plies are noticeable, the softwood plies are inclined to sliver on the long grain and chip on the cross grain, and there are occasional voids in the core. Consequently, veneer-core plywood is used where the initial cost of the construction material is a factor.

FIGURE B


Face Veneer Layer
Back Veneer Layer
Hardwood-Veneer Core
Softwood Crossband Veneer Layers

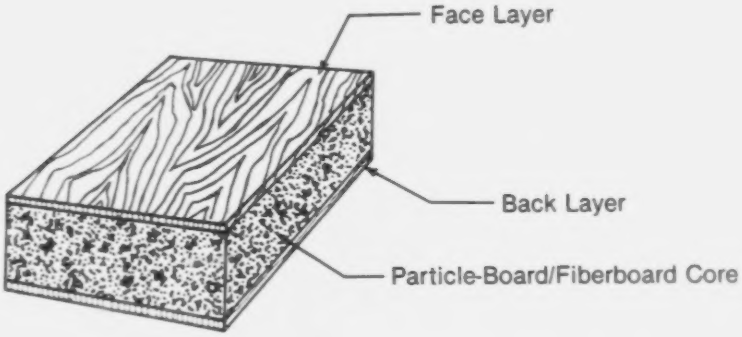
SUPPLEMENT #5

Particle-board/fiberboard-core construction. In these types of construction a particle-board or fiberboard core is sandwiched between a back and face layer. See Figure C.

Particle-board plywood offers stability nearly equal to lumber-core plywood, its surface is smooth, and the better particle-board plywoods also hold screws well, maintain their shape acceptably, and cost about the same as veneer-core plywood. Core construction is revealed at the edges in this type of construction, but these edges are no more objectionable than those in veneer-core plywood.

Fiberboard is produced much like particle board in that both are fabricated ground-wood products. However, the wood in fiberboard is ground more finely than for particle board, making fiberboard denser than particle board. Therefore, fiberboard-core plywood has all of the advantages of particle-board plywood with the added advantage of a denser core, making the edges machine better and look more like solid wood.

FIGURE C



What is softwood plywood?

Softwood plywood is a utility product that is used for nondecorative purposes or for surfaces that will be painted. Softwood plywood is almost never seen with a natural finish because even the top grades have patches on the face and back.

What are the standard softwood classes?

Softwood plywoods are classed as interior (INT) or exterior (EXT). Interior plywoods are made with a moisture-resistant glue, while exterior plywoods are made with a waterproof glue. Exterior plywood is stamped "EXT-APA" and/or painted red on one edge; interior plywood is painted green on one edge.

SUPPLEMENT #5

How are softwood plywoods graded?

Softwood plywoods are graded by their face veneers using a system of letters to show the quality of the veneers. Each face is graded, and the plywood is then designated by the letter grades of the two face veneers, such as A-B, A-D, or C-D. See Table B.

TABLE B: Standard softwood plywood grades (by face veneer)

Interior	Exterior
A-A	A-A
A-B	A-B
A-D	A-C
B-B	B-B
B-D	B-C
C-D	C-D

What do the letters of the softwood plywood grading system mean?

A — Smooth, paintable, well-jointed; permits more than eighteen neatly made boat-, sled-, or router-type repairs parallel to grain.

B — Relatively smooth; permits circular repair plugs and small, tight knots to 1 inch; wood or synthetic patching material may be used; some minor splits are permitted.

C — Permits tight knots to 1½ inches; permits knotholes to 1 inch and some to 1½ inches if total width is within specified limits; synthetic or wood repairs are permitted; limited splits are allowed.

D — Permits knots and knotholes to 2½ inches in width and ½ inch larger under certain specified limits; limited splits are permitted.

How is softwood plywood sized?

Softwood plywood usually comes in 48″ × 96″ sheets, with the grain of the face veneer running parallel to the 96-inch dimension. When available, longer lengths normally carry a premium.

Standard thickness (net after sanding) found in most dealer stocks will include the following

¼″ - 3 ply	½″ - 5 ply	¾″ - 5 or 7 ply
⅛″ - 3 ply	⅝″ - 5 ply	1″ - 7 ply

How do you write specifications for softwood plywood?

Writing softwood-plywood specifications is a simple matter. The following are examples of specifications that will be clear to any plywood dealer. Other sizes and grades can easily be specified with the necessary variations.

10 pcs. ¼ × 48 × 96″ Interior Fir, A - D
10 pcs. ¼ × 48 × 96″ Exterior Fir, A - C
5 pcs. ¼ × 48 × 96″ Interior Fir, A - B
3 pcs. ¼ × 48 × 96″ Exterior Fir, A - B
1 pc. ⅝ × 60 × 108″ Exterior Fir, Table Tennis Top, A - C

SUPPLEMENT #5

When is hardwood plywood used?

Practically all stock hardwood plywood is made for interior use only. Do not attempt to order waterproof hardwood plywood without first establishing its availability from your supplier.

How are hardwood plywoods graded?

TABLE C: Standard hardwood plywood grades (by face veneer)*

Grade	Face veneer	Allowable defects
1	*Premium* — Book matched or slip matched (repeating grain figure but unmatched joints) for pleasing effect	Permits burls, pin knots, slight color streaks, and inconspicuous small patches in limited amounts.
1	*Good* — Unmatched but sharp constrasts in color, grain, and figure not permitted	Permits burls, pin knots, slight color streaks, and inconspicuous small patches in limited amounts.
2	*Sound* — Free from open defects	Permits all appearance defects so long as smooth and sound. Permits smooth patches.
3	*Utility* (reject)	Permits all natural defects including open knots, wormholes, and splits, maximum size of which are defined.
4	*Backing*	Permits practically unlimited defects; only strength and serviceability are considered.

*NBS Voluntary product standard PS 51-71 obtained from Supt. of Documents, Washington D.C. 20402. In order to show hardwood plywood face veneer grades at a glance, the information given in the above table has been greatly oversimplified. For complete grading rules, including specialty grades, grading of cores and the like, see Product Standards PS 51-71. Any grade combination of face and back veneers can be obtained in hardwood plywood, although dealers' stocks are ordinarily limited to the combinations most popular in the trade.

What do the terms associated with the hardwood plywood grading system mean?

Good 1 Side (G1S). A G1S plywood panel has one good side in the species ordered. This face must be reasonably well-matched in color and graining at the juncture of any two or more veneers. The back is faced with reject veneer in any species the factory selects. G1S panels made on the West Coast are graded A-3.

SUPPLEMENT #5

Good 1 Side — Sound Back (G1S - So. Bk.) G1S — So. Bk. panels have one good face in the species ordered, and the back veneers are usually faced with the same species as the front but in a grade that permits tight burls and other small sound defects. Unless otherwise stipulated, the core may be any species of wood, at the option of the factory, and need not be entirely sound (if you cut the panel into smaller pieces, voids in the core may be encountered). On the West Coast, G1S - So. Bk. panels are graded A-2.

Craftsman and *Shop.* Occasionally dealers may offer special lower-priced grades, usually of good quality. While not quite so well-matched as the true G1S grade, they are very satisfactory otherwise, especially when they are to be cut into small sizes. These special grades often represent a worthwhile savings.

How is hardwood plywood sized?

The length of a plywood panel is usually the dimension parallel to the direction of the grain in the face. For example, vertical hardwood-plywood wall panels are 48 inches wide by 96 inches long.

How do you write specifications for hardwood plywood?

The following are examples of specifications for hardwood plywood. If you use the terms G1S — So. Bk., etc., your order will be easily understood.

5 pcs. 1/4 × 48 × 96" Plain Sliced Red Oak, G1S
8 pcs. 3/4 × 48 × 96" Plain Sliced Walnut, lumber core, G1S—So. Walnut Bk.
3 pcs. 1/4 × 48 × 96" Natural Birch, G1S—So. Birch Bk.
2 pcs. 3/4 × 48 × 96" Ribbon Philippine Mahogany, G1S—So. Bk.

Supplement #5 adapted with permission of the Frank Paxton Lumber Company, from *Beautiful Woods*, 1974.

SUGGESTED ACTIVITIES

SUPPLEMENT #6 — NAIL FACT SHEET

How are nails used in construction?

The nail, one of the most common forms of rough hardware, is considered to be *the* simplest and quickest fastener when used to join wood to wood. But, the nail is also an economical fastener when used to join metal and other materials to wood members.

How are the two main types of nails manufactured?

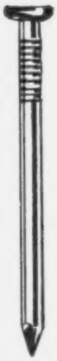
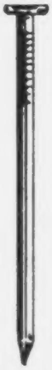
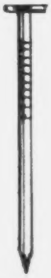
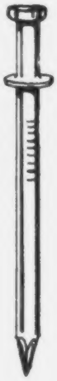
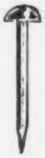
Wire nails. Wire nails are actually cut and shaped from steel wire. They are used for both rough and finish construction.

Cut nails. Cut nails are sheared from flat nail plate. They are used mainly for rough construction and concrete work.

How are nails classified?

A nail is classified according to the appearance of its head, shank, and point. In order to select the proper nail for the job, you must be familiar with the characteristics of each of the three parts of a nail.

TABLE A: Examples of nailhead shapes

Flat head			**Duplex head**	**Oval head**
				
Common nail	Box nail	Shingle nail		

SUPPLEMENT #6

TABLE A (continued)

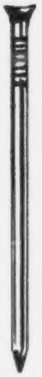
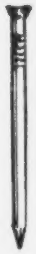
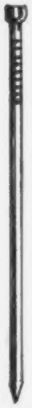
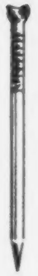
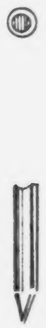
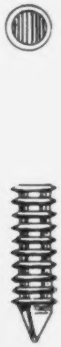
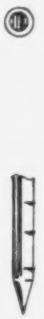
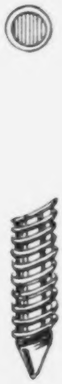
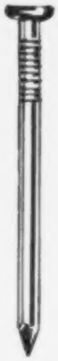
Conical head		Barrel-shaped head	
			
Casing nail	Flooring nail	Finish nail	Wire brad

TABLE B: Examples of nail shanks

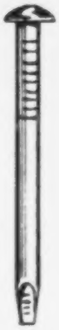
Round shank	Annular shank	Barbed shank	Screw shank
			

SUPPLEMENT #6

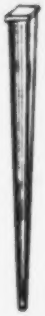
TABLE C: Examples of nail points



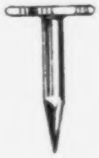
Diamond point



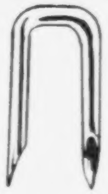
Chisel point



Blunt point



Needle point



Side point

How do the head, shank, and point characteristics determine nail selection?

- Large, flat nailheads have more holding area than small heads; therefore, flat-headed nails such as roofing and gypsum-board nails are used to nail soft, fibrous materials.
- Brads, finish, casing, and flooring nails have small heads. Such nails are used to hold finish work because the heads can be countersunk below the surface.
- Duplex-headed nails are used on temporary structures because these nails are easily removed by hooking the extra head with a wrecking bar or claw hammer.
- Barbed-, annular-, spiral-, and screw-shank nails have more holding power than smooth-shank nails.
- Smooth-shank nails are easier to install than barbed-, annular-, spiral-, or screw-shank nails.
- Long diamond-point nails are used to fasten hinges, flooring, gypsum board, and certain types of roofing material.
- Nails with blunt points cut through the wood and do not push the wood fibers apart, which may cause the wood to split.
- Blunt-point nails have less holding power than pointed nails.

SUPPLEMENT #6

What are the factors to consider when selecting the right nail for the job?

- Type of material to receive the nail
- Amount of stress and strain to be placed on the nailed material
- Conditions (weather, moisture, chemicals, soil, heat, etc.) under which nails are to be exposed
- Finish requirements (how the job should appear when it is finished)

How are nails sized?

Most nails are sized (in length) according to the "penny system." The penny system was established long ago in England, where certain nails could be purchased for either a six-pence or a ten-pence per one hundred nails. Gradually, the price of the nails became associated with the length of the nails, and they became six-penny and ten-penny nails. The letter *d* is the abbreviation for "penny." The *d* is derived from the Roman word *denarius*, which means "a coin."

For nails measured under the penny system, the 2d nail is the standard by which other nails are sized. A 2d nail is 1 inch long; 1/4 inch is added for each additional penny in size up to 3 inches in length. Therefore, a 3-inch nail is a 10d nail.

Other nails are measured in inches. For example, nails smaller than 2d are measured by the fraction of an inch, and spikes (nails 20d or larger), roofing nails, brads, gypsum-board nails, and hinge nails are measured in inches.

What are the most commonly used types of nails?

Common nails. Common nails are made of wire, have flat heads, and range in size from 2d to 60d. The larger common nails are known as *spikes*. Common nails are used for rough work such as framing, fencing, and form building, where holding power is important.

Box nails. Box nails range in size from 2d to about 40d. Like common nails, box nails are made of wire and have flat heads, but box nails have a smaller diameter than common nails and, therefore, have less tendency to split the lumber. Box nails are used for building crates and boxes, and to attach siding.

Finishing nails. Finishing nails range in size from 2d to 20d. They have small, barrel-shaped heads that can be sunk below the wood surface to allow the nail hole to be filled with wood filler or putty to create a smooth finished surface on cabinet trims and cupboards.

Flooring nails. Flooring nails range in size from about 7d to 10d, and they look very much like finishing nails except that their shank diameters and heads are slightly larger. However, flooring-nail heads can still be countersunk to create a smooth surface to install flooring and other heavy materials.

SUPPLEMENT #6

Casing nails. Casing nails range in size from 4d to 40d. Casing nails, like flooring nails and finishing nails, have heads that can be countersunk, but casing nails are thicker than finishing nails and have a smaller head and shank than flooring nails. Casing nails can be used to install flooring, but they are mainly used for outside finish work.

Roofing nails. Roofing nails range in size from about 3/4 inch to 2 inches. They are galvanized, have very large, flat heads, and usually have barbed shanks. Roofing nails are used to install rolled roofing and shingle-asphalt roofing.

Plasterboard (gypsum-board) nails. Plasterboard nails are small, flat-headed nails that range in length from 1 inch to 1 1/2 inches. Plasterboard nails are usually used to fasten plasterboard to a wood base, but they may also be used to apply rock lath (a base for plastering).

Shingle nails. Shingle nails are small, flat-headed nails that range in size from 3d to 6d. Galvanized shingle nails are used to install wood shingles.

Hinge nails. Hinge nails may have either oval or countersunk, flat heads, and they range in size from 4d to 20d. They have good holding power and are used to to install lattice and roofing.

Staples. Staples range in size from 3/8 inch to 2 inches, and the different sizes are used for different purposes. Staples with a wide (1-inch) crown are used with a staple gun for millwork and butt-joining, and to attach asphalt shingles and ceiling materials. Staples used to attach barbed wire and heavy-net wire are about 1 inch long, while staples used to attach small-mesh wire may be less than 3/4 inch long. Staples used to attach fencing vary in size from 3/4 inch to 2 inches.

Supplement #6 adapted with permission of Vocational Instructional Services, Texas A & M University, College Station, Texas, from *Identification and Use of Nails, Screws, Bolts, and Other Fasteners.*

SUGGESTED ACTIVITIES

SUPPLEMENT #7 — WOOD-SCREW FACT SHEET

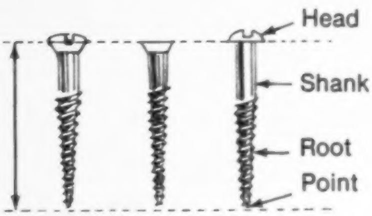
How are screws used in construction?

Screws are the second most commonly used fastening device, with nails ranking first. Screws are not used as frequently as nails because screws are more expensive and cannot be installed as quickly. However, screws do have some advantages over nails that may make their use more practical for certain projects. Screws have greater holding power than nails, they give a neater, more-decorative appearance to the finished project, and they can also be removed with less damage to the material.

What are the parts of a screw?

The parts of the screw include the head, shank, root, and point. See Figure A. The shank is the unthreaded part of the lower portion of the screw and the root is the threaded part.

FIGURE A

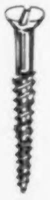
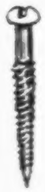
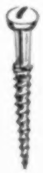
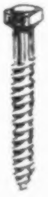
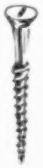


How are screws classified?

Screws are classified according to the appearance of their screw heads, screw-head slots, gauge, length, and metal type and finish. In order to select the proper screw for the job, you must be familiar with the characteristics of these parts of a screw.

Screw-head shapes. Screw heads may be flat, round, oval, square, or fillister (semi-oval) in shape. See Table A.

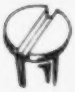
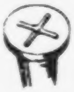
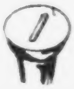
TABLE A: Examples of screw-head shapes

Flat head	**Round head**	**Oval head**	**Square head**	**Fillister head (semi-oval head)**
				

SUPPLEMENT #7

Screw-head slots. Screw heads may have single slots, cross slots (Phillips-head), or drive-screw slots (slots that do not extend to the edges of the screw head). See Table B.

TABLE B: Examples of screw-head slots

Single slot	**Cross slot**	**Drivescrew slot**
		

Length. Screw length is determined by measuring from the screw point to the base of the head.

Gauge. The gauge of a screw is determined by the diameter of the shank, which depends on the size of the wire used to make the screw.

Metal type and finish. Most screws are made from soft steel with a nickel, zinc, or brass coating to retard corrosion. However, other metals (brass, bronze, copper, and aluminum) are also used to make screws. The place where the screw is to be used determines both the kind of metal used for the screw and for its coating.

How do screw characteristics determine screw selection?

- If screw heads must be flush with the surface, use flat-head screws because the heads can be counterbored and covered with a plug.
- If there is danger of splitting the work material with the wedge-shaped taper of a flat-head screw, if a washer is needed with the screw, or if an ornamental appearance is required, use a round-head screw.
- For a stronger hold than the flat-head screw can supply, use an oval-head screw. Oval-head screws are also used to give an ornamental effect, because even when the heads are countersunk the curved part of the head still protrudes.
- Fillister-head screws are versatile because they can be used with the entire head above the work surface, or with the oval part of the head left above the work surface and then counterbored. Also, use a fillister-head screw when you do not want to split the wood due to wedging.
- The cross slot of a Phillips-head screw allows you to drive the screw rapidly without having the screwdriver slip from the slot; therefore, use it in production work. The Phillips-head screw is also considered to have greater drawing power than the single-slot screw.
- If strong holding power is required, such as for expansion shields in brick, concrete, or rock walls, use leg screws (also called *lag screws* or *lag bolts*). Leg screws resemble bolts in that they have square- or hexagon-shaped heads and are larger than ordinary. They range in size from 1/4 to 5/8 inch in diameter and 1 to 6 inches in length. Leg screws are usually made of black or galvanized iron or bronze.

SUPPLEMENT #7

- Self-drilling screws cut their own holes.
- Drywall screws are used to fasten drywall.
- Screw eyes and screw hooks are used to attach and suspend articles.

Supplement #7 adapted with permission of Vocational Instructional Services, Texas A & M University, College Station, Texas, from *Identification and Use of Nails, Screws, Bolts, and Other Fasteners*.

SUGGESTED ACTIVITIES

SUPPLEMENT #8 — GLUE FACT SHEET

In the old days when you wanted a strong bond for wood, you got out the glue pot and heated up a quantity of animal glue. Today, for the most part, we use adhesives just as they emerge from their containers. Most people are not experts at using adhesives well, but you can get excellent results if you choose the right type of adhesive and follow the manufacturer's instructions to the letter.

You can find out what kind of glue you have or intend to buy by reading the label. The table below describes some of the more common kinds of glue with a comment about each type.

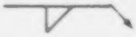
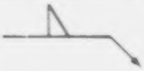
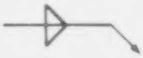
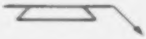
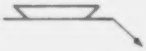
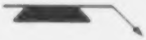
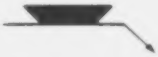
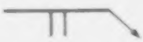
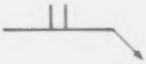
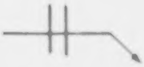
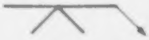
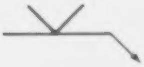
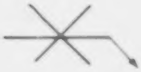
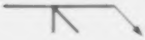
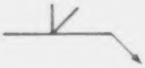
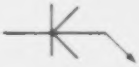
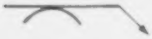
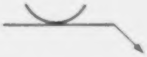
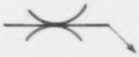
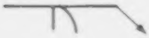
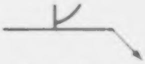
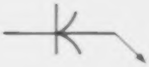
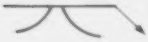
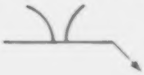
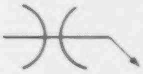
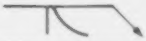
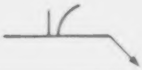
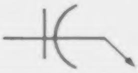
Kinds of glue

Name	Comment
Polyvinyl acetate	We know it as "white glue" regardless of its brand name. Used for most repairs around the house, especially light wood and paper products. Very good if you remember not to use it for joints that will be under stress or exposed to water.
Cyanoacrylate	The so-called "super" adhesive. Very strong when used on almost anything except paper, wood, or polyethylene. Resists water. Must be handled with care so as not to get any on your skin.
Epoxy	Strong, durable, waterproof. Bonds almost anything, but check label for plastics and rubber. Usually comes in two tubes. Contents must be mixed before use.
Urea formaldehyde	Ideal for heavy wood joints that must be extra strong. It's a plastic resin and very water-resistant, but not waterproof.
Caseins	Standard wood glues for regular joints as well as those that do not fit perfectly. Not waterproof nor quite as water-resistant as urea formaldehyde.
Contact cement	Originally formulated to bond laminated plastic to plywood or similar base. Now used for most bonds where clamping is not required. Special type needed for bonding wood to wood. All kinds require careful matching of parts, since the cement bonds both surfaces instantly.
Cellulose cement	Comes in small tubes. Used mostly on delicate jobs, such as bonding broken glass and china. Most brands are waterproof, but check the label.
Resorcinol	The old standby for large joints under stress and for all joints used outdoors, including those on boats. Must be mixed according to directions.

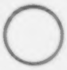
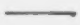
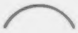
(NOTE: When an adhesive is waterproof, it should say so on the container. *Water-resistant* does not mean *waterproof*.)

Supplement #8 adapted with permission of AP Newsfeatures, from "No Perfect Glue for All Purposes," by Andy Lang.

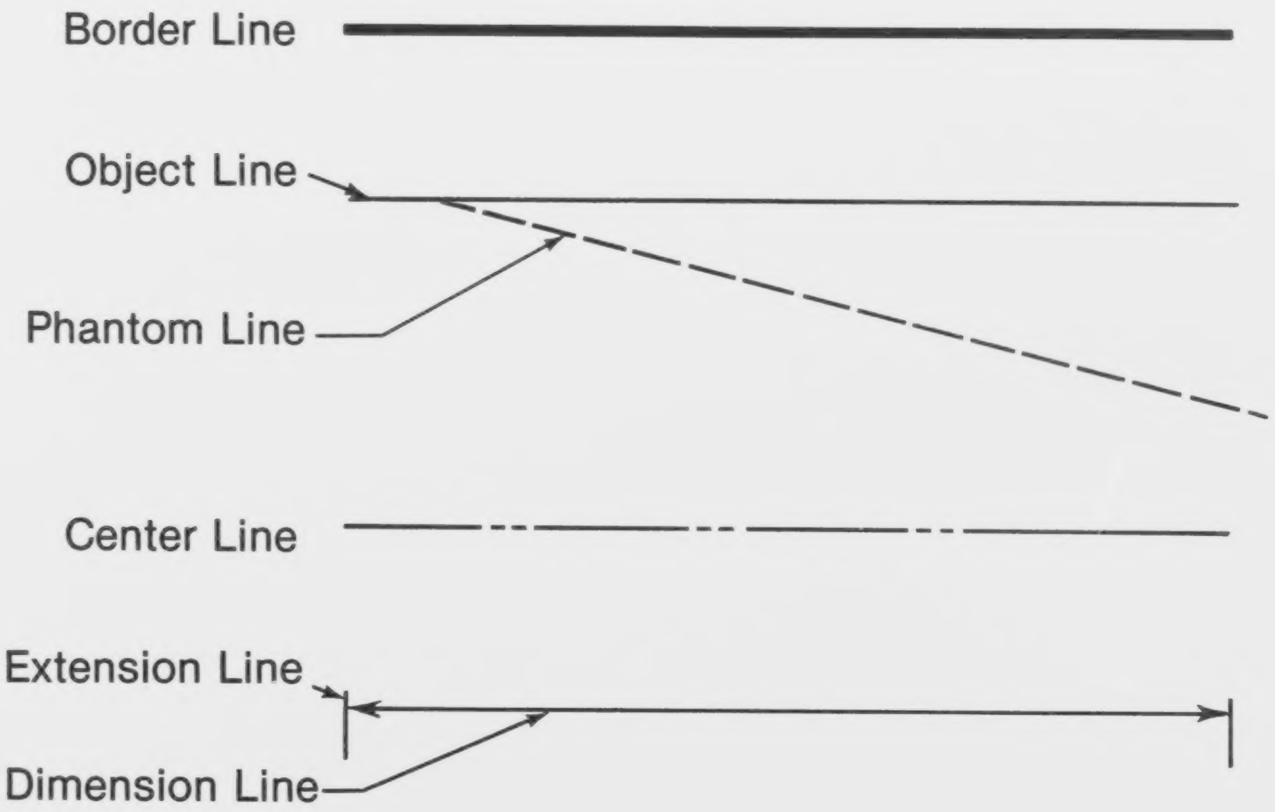
Basic Welding Symbols

Weld type	Arrow side	Far side	Both sides
Fillet			
Plug or slot			Not used
Arc seam, arc spot			Not used
Butt or groove, square			
V			
Bevel			
U			
J			
Flare V			
Flare bevel			

Supplementary symbols

Weld all around	Field weld	Flush contour	Convex contour
			

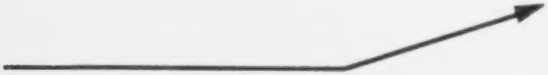
Basic Lines Used in Drawing and Sketching


Border Line
Object Line
Phantom Line
Center Line
Extension Line
Dimension Line

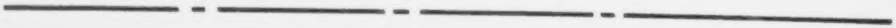
Basic Lines Used in Drawing and Sketching

(Continued)

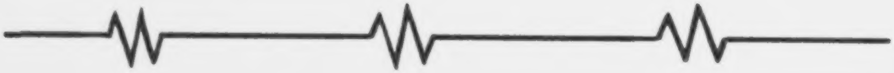
Leader Line



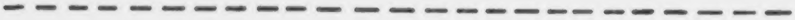
Cutting-Plane Line
(Section Line)



Break Line

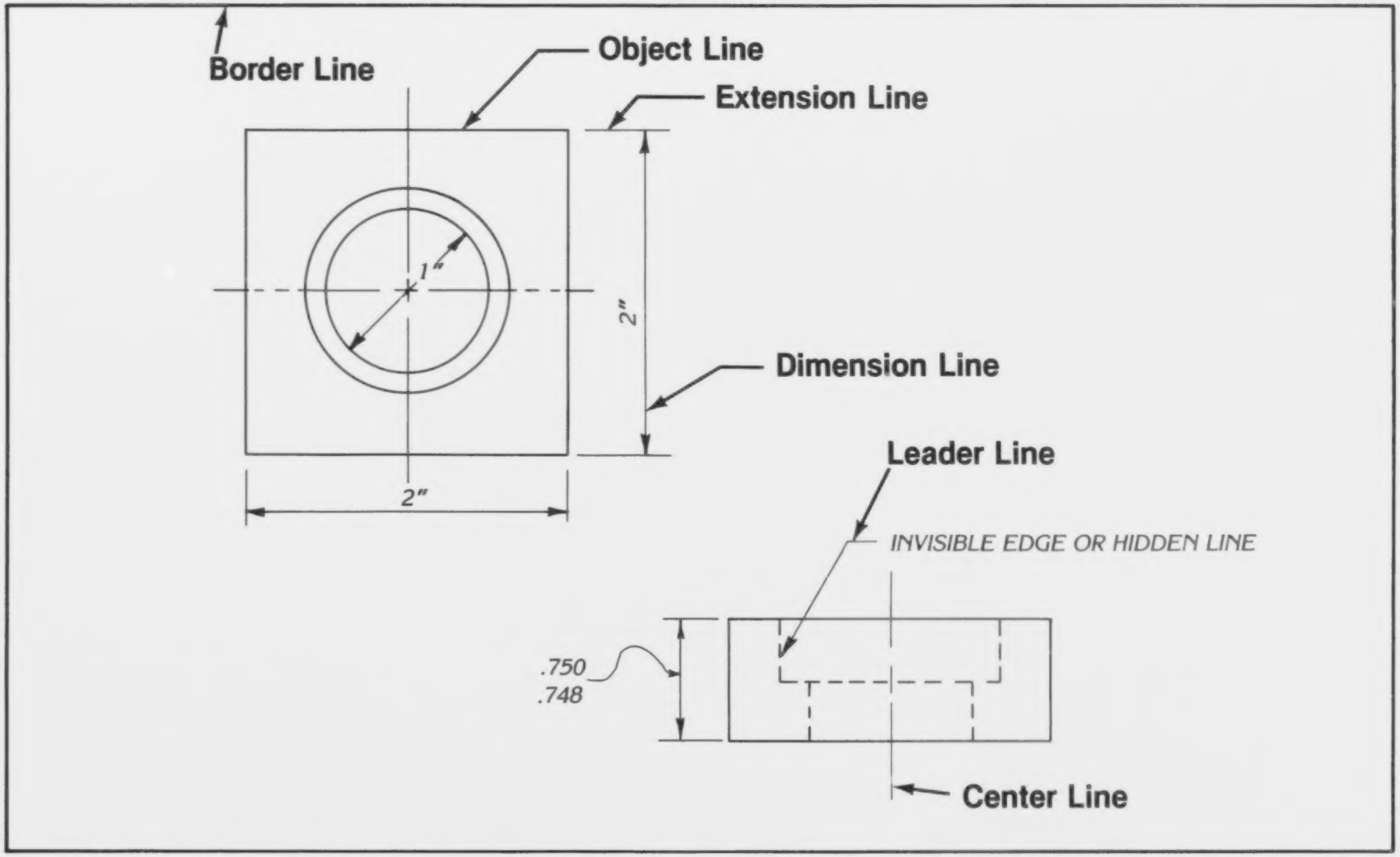


Hidden Line

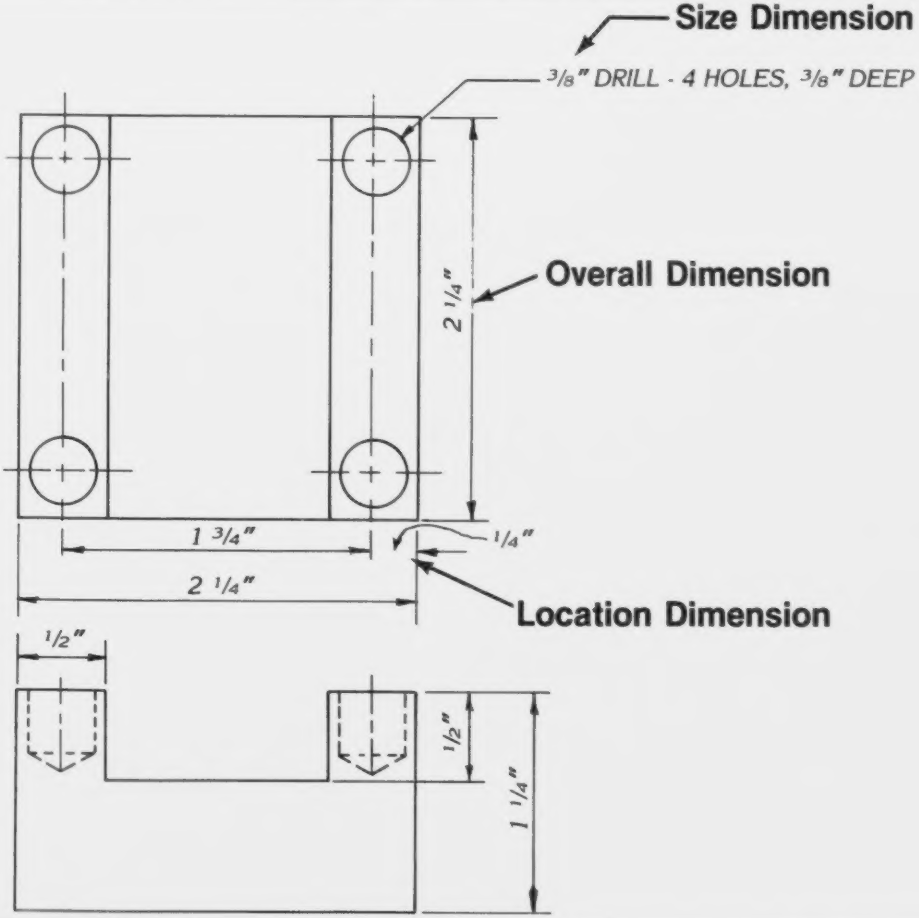


TM #3

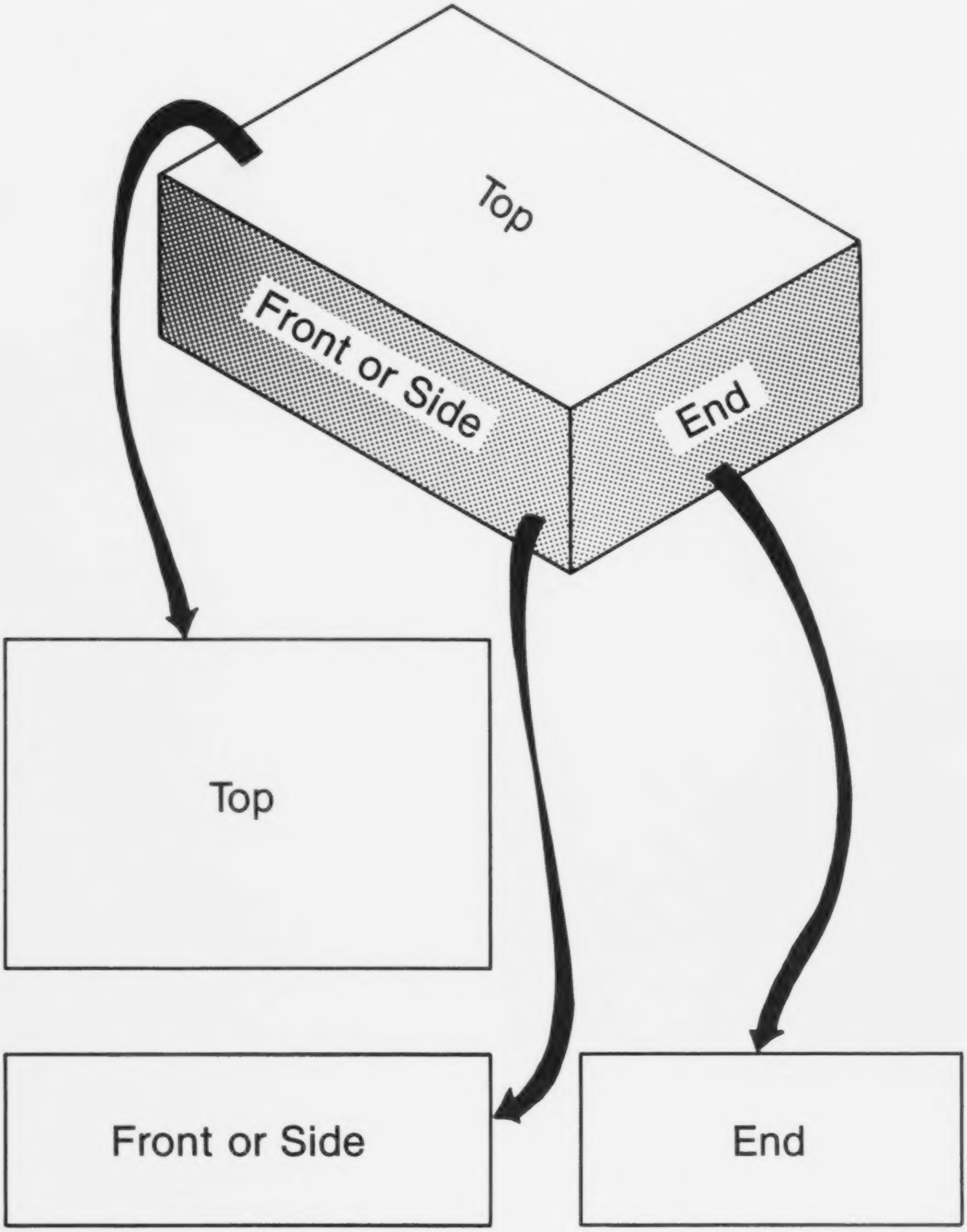
Use of Lines on a Drawing


Border Line
Object Line
Extension Line
1"
2"
2"
Dimension Line
Leader Line
INVISIBLE EDGE OR HIDDEN LINE
.750
.748
Center Line

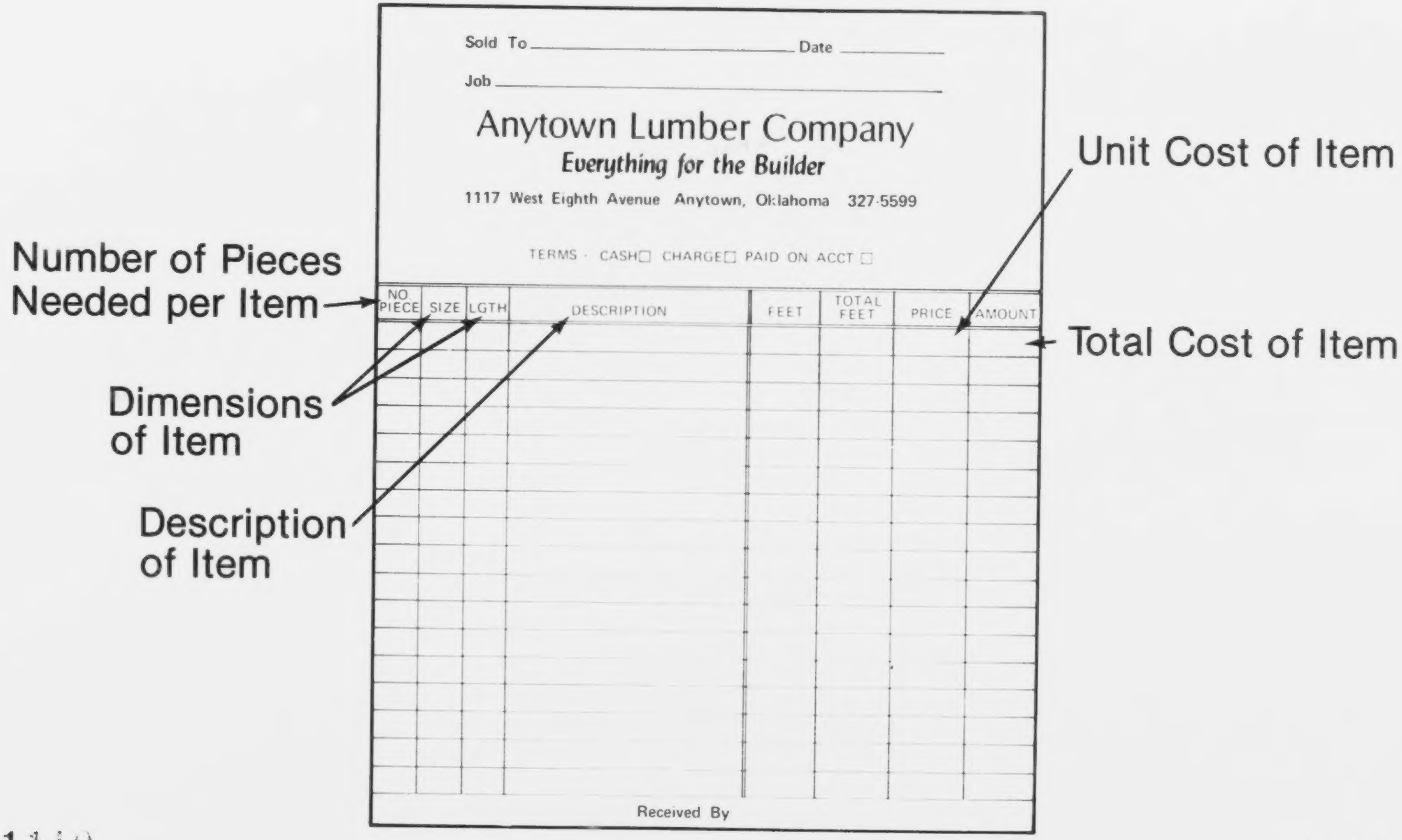
Types of Dimensions on a Drawing


Size Dimension
3/8" DRILL - 4 HOLES, 3/8" DEEP
Overall Dimension
2 1/4"
1 3/4"
1/4"
2 1/4"
Location Dimension
1/2"
1/2"
1 1/4"

Converting a Pictorial View into a Three-Sided View


Top
Front or Side
End
Top
Front or Side
End

Shopping Bill-of-Materials



Sold To ______________________ Date __________

Job ________________________________

Anytown Lumber Company

Everything for the Builder

1117 West Eighth Avenue Anytown, Oklahoma 327-5599

TERMS · CASH☐ CHARGE☐ PAID ON ACCT ☐

NO. PIECE	SIZE	LGTH	DESCRIPTION	FEET	TOTAL FEET	PRICE	AMOUNT

Received By

Number of Pieces Needed per Item
Dimensions of Item
Description of Item
Unit Cost of Item
Total Cost of Item

TM #7

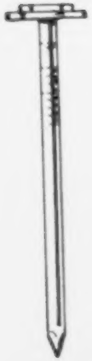
1110

1111

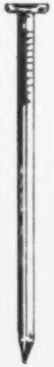
VO AG II - 303-E

BEST COPY AVAILABLE

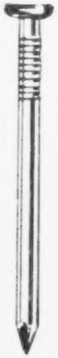
Types of Nails



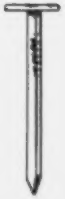
Lead-Head



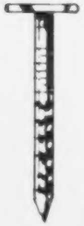
Box



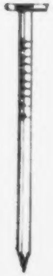
Common



Plasterboard



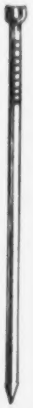
Roofing



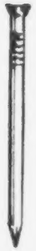
Shingle

Types of Nails

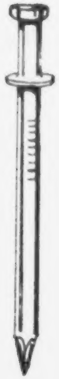
(Continued)



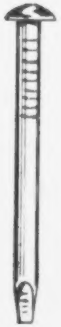
Finishing



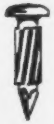
Flooring



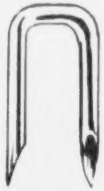
Duplex



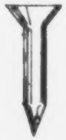
Hinge



Masonry

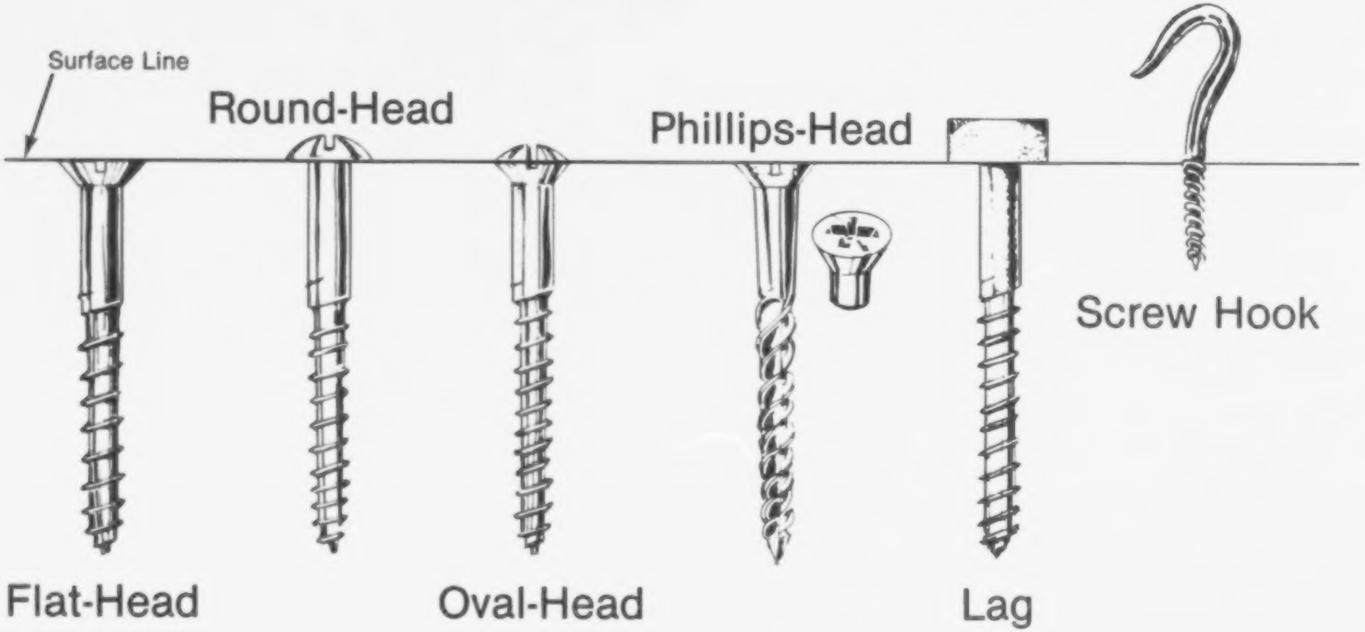


Wire Staple

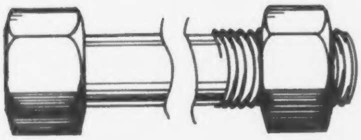


Concrete

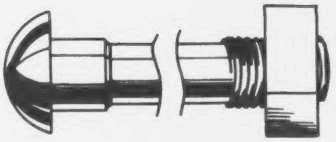
Types of Wood Screws


Surface Line
Round-Head
Phillips-Head
Screw Hook
Flat-Head
Oval-Head
Lag

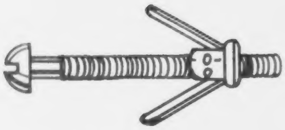
Types of Bolts



Machine



Carriage



Toggle

PLAN PROJECT CONSTRUCTION
UNIT IV

INFORMATION SHEET

I. Questions to ask yourself when considering a construction project

   A. Are the materials I will need readily available or obtainable?

   B. Am I skilled enough to complete the construction project?

   C. Do I have the tools ! will need to complete the project?

   D. Do I have adequate drawings, or can I sketch or draw the project myself?

   E. Is the cost of the project within my limits?

II. Terms associated with reading and drawing project plans

   A. Engineer's drawing — Detailed working plan drawn to scale and showing all information and dimensions necessary to build an object

   B. Sketch — Rough drawing representing chief features of an object to be built

   (NOTE: A sketch is usually made without the aid of drafting instruments.)

   C. Blueprint — Reproduction of an engineer's drawing

   (NOTE: A true blueprint has white lines on a blue background; however, most of today's reproductions produce a black-, blue-, or sepia-colored line on a white background.)

   D. Dimension — Conventional lines and figures illustrating actual sizes and distances of objects and spaces represented

   E. Scale — Proportion between two sets of dimensions, such as that between a drawing and the actual object

   F. Pictorial drawing — Illustration showing three or more sides of an object

III. Principal parts of a drawing and their descriptions (See Figure 1)

   A. Body — Contains different views of the object to be built, dimensions, welding symbols, notes, and other information

   B. Title block — Contains basic information about the drawing

   (NOTE: The title block is usually located in lower right-hand corner of the drawing.)

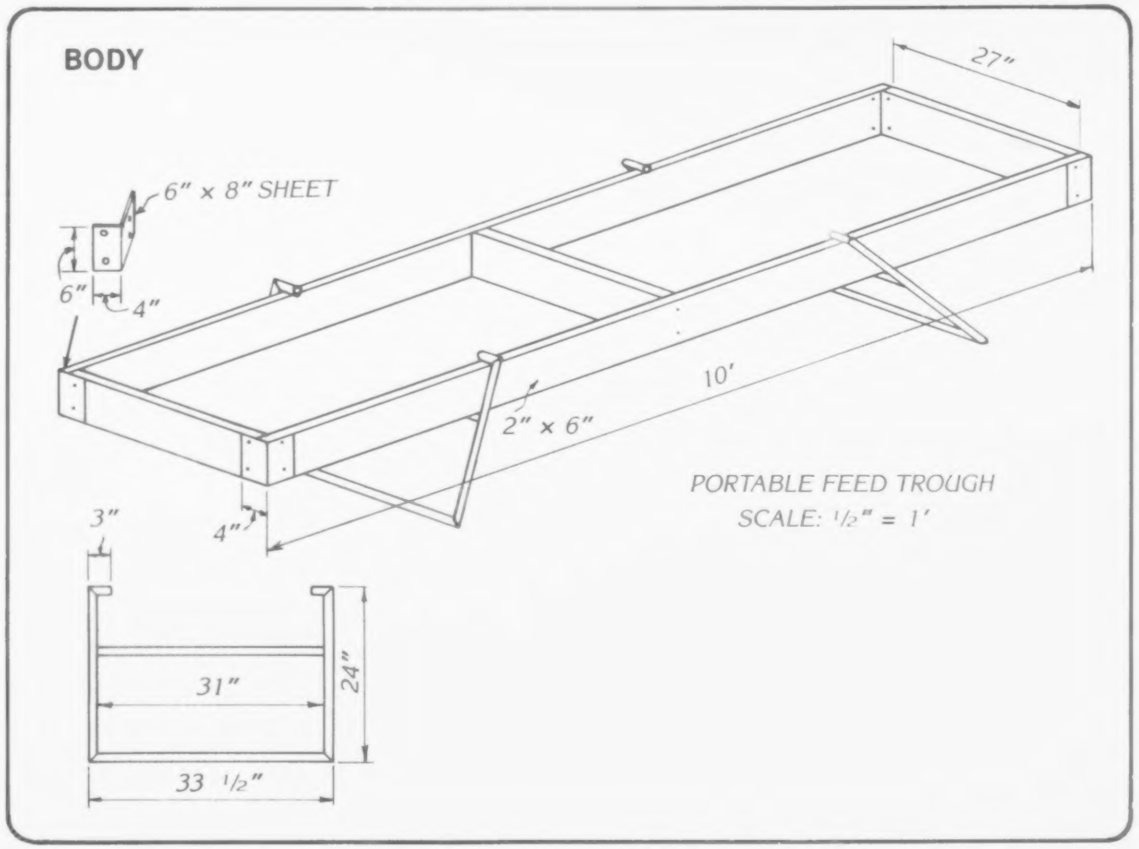
   C. Bill of materials — Provides itemized list of number, kind, and dimensions of each piece of material needed to construct an object

   (NOTE: The bill of materials is usually located in the upper right-hand corner of the drawing. You will need to consult this list when you order the materials for your project.)

INFORMATION SHEET

EXAMPLE:

FIGURE 1



BILL OF MATERIALS

BILL OF MATERIALS
2 PIECES OF 2" x 6" BOARDS 14' LONG
5 PIECES OF 1" x 8" SHIPLAP 10' LONG
16 CARRIAGE BOLTS 1/4" x 2"
4 PIECES OF SHEET IRON 1/8" x 6" x 8"
1 PIECE OF 1 1/4" PIPE 14' LONG
1 PIECE OF 1" PIPE 5 1/2" LONG

TITLE BLOCK

DRAWN BY: BOB REA

CURRICULUM AND INSTRUCTIONAL MATERIALS CENTER
STATE DEPARTMENT OF VOCATIONAL AND TECHNICAL
EDUCATION STILLWATER, OKLAHOMA

IV. Descriptions of the basic elements in the body of a drawing

(NOTE: When an engineer's drawing is available for the project you are considering, you must be familiar with the basic elements of a drawing in order to read it. However, when an engineer's drawing is not available, you must know these basic elements in order to produce your own drawing or sketch.)

A. Lines — Show shape and dimensioning of object

B. Dimensions — Show size and locations of various segments of object

C. Notes — Explain details of construction not shown by lines and dimensions

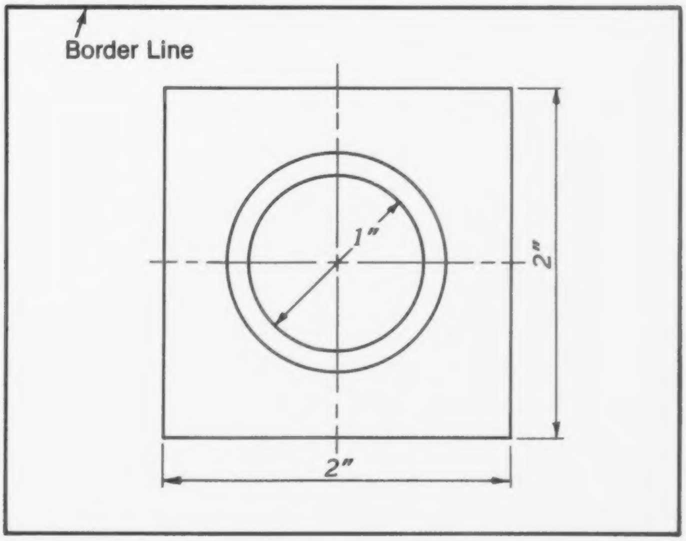
INFORMATION SHEET

V. Basic lines used in the body of a drawing (Figures 2-12)

A. Border line

(NOTE: Border lines are used to frame the drawing.)

FIGURE 2



B. Object line

(NOTE: Object lines show the main outline of the object represented in the drawing.)

FIGURE 3

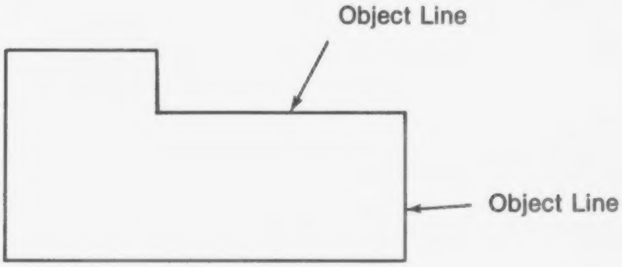


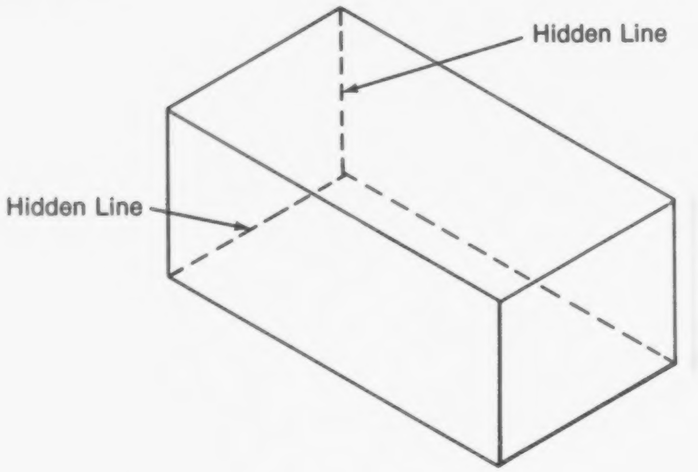
Figure 3 used with permission of the Research and Curriculum Unit for Vocational-Technical Education, Mississippi State University, from *Basic Blueprint Reading*, by Pamela South, 1983.

INFORMATION SHEET

C. Hidden line

(NOTE: Hidden lines show lines that are not visible from the view depicted in the drawing.)

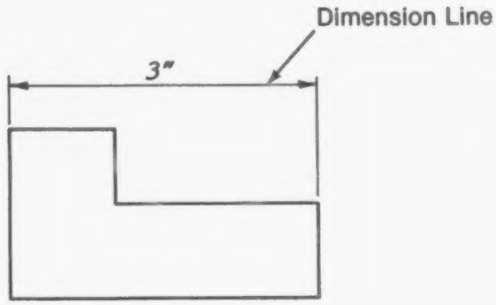
FIGURE 4



D. Dimension line

(NOTE: Dimension lines are used to designate object and area dimensions; they usually end in arrows or dots, and the dimension is usually written above the dimension line.)

FIGURE 5



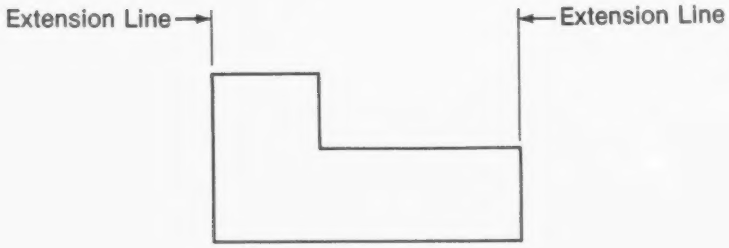
Figures 4 and 5 used with permission of the Research and Curriculum Unit for Vocational-Technical Education, Mississippi State University, from *Basic Blueprint Reading*, by Pamela South, 1983.

INFORMATION SHEET

E. Extension lines

(NOTE: Extension lines are used as parameters for dimension lines.)

FIGURE 6


Extension Line
Extension Line

F. Center line

(NOTE: Center lines designate the center of an object.)

FIGURE 7

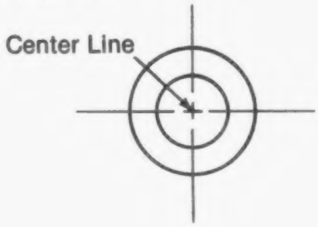
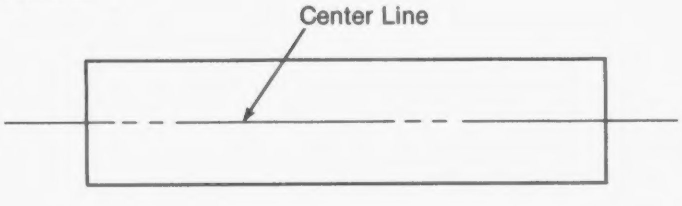

Center Line

FIGURE 8


Center Line

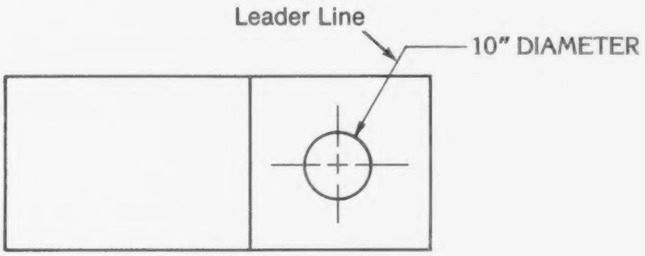
Figures 6 through 8 used with permission of the Research and Curriculum Unit for Vocational-Technical Education, Mississippi State University, from *Basic Blueprint Reading*, by Pamela South, 1983.

INFORMATION SHEET

G. Leader line

(NOTE: Leader lines connect a note or a dimension to a related part of the drawing.)

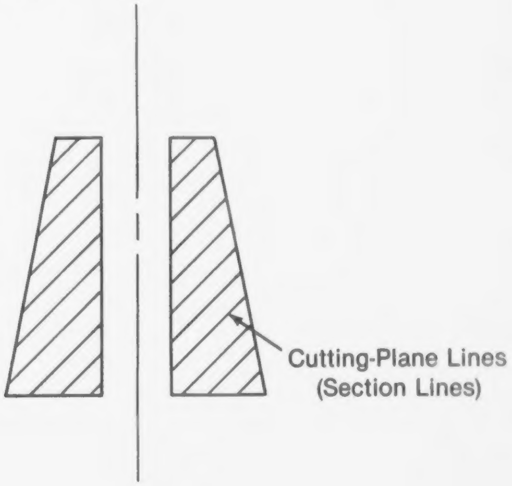
FIGURE 9


Leader Line
10" DIAMETER

H. Cutting-plane lines (section lines)

(NOTE: Cutting-plane lines indicate that an area has been cut away and is shown in a section. Arrows indicate the direction from which the drawing is to be viewed.)

FIGURE 10


Cutting-Plane Lines
(Section Lines)

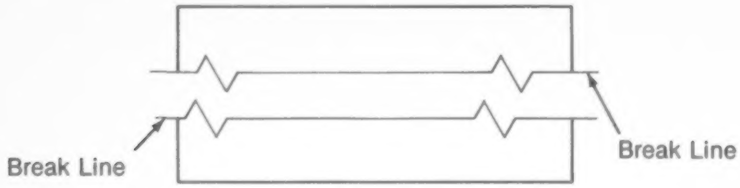
Figures 9 and 10 used with permission of the Research and Curriculum Unit for Vocational-Technical Education, Mississippi State University, from *Basic Blueprint Reading*, by Pamela South, 1983.

INFORMATION SHEET

I. Break line

(NOTE: Break lines show that an object or area has not been drawn in its entirety.)

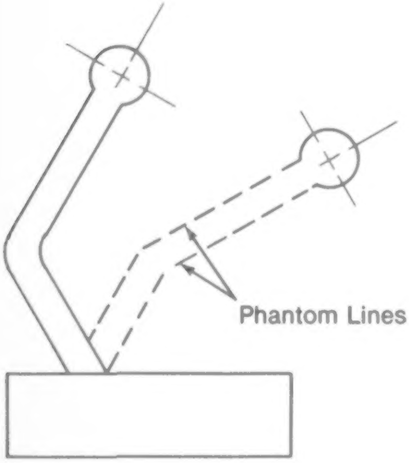
FIGURE 11



J. Phantom line

(NOTE: Phantom lines indicate alternative positions of moving parts, adjacent positions of related parts, and repeated details.)

FIGURE 12



Figures 11 and 12 used with permission of the Research and Curriculum Unit for Vocational-Technical Education, Mississippi State University, from *Basic Blueprint Reading*, by Pamela South, 1983.

INFORMATION SHEET

VI. Descriptions of the types of dimensions used in the body of a drawing (Figure 13)

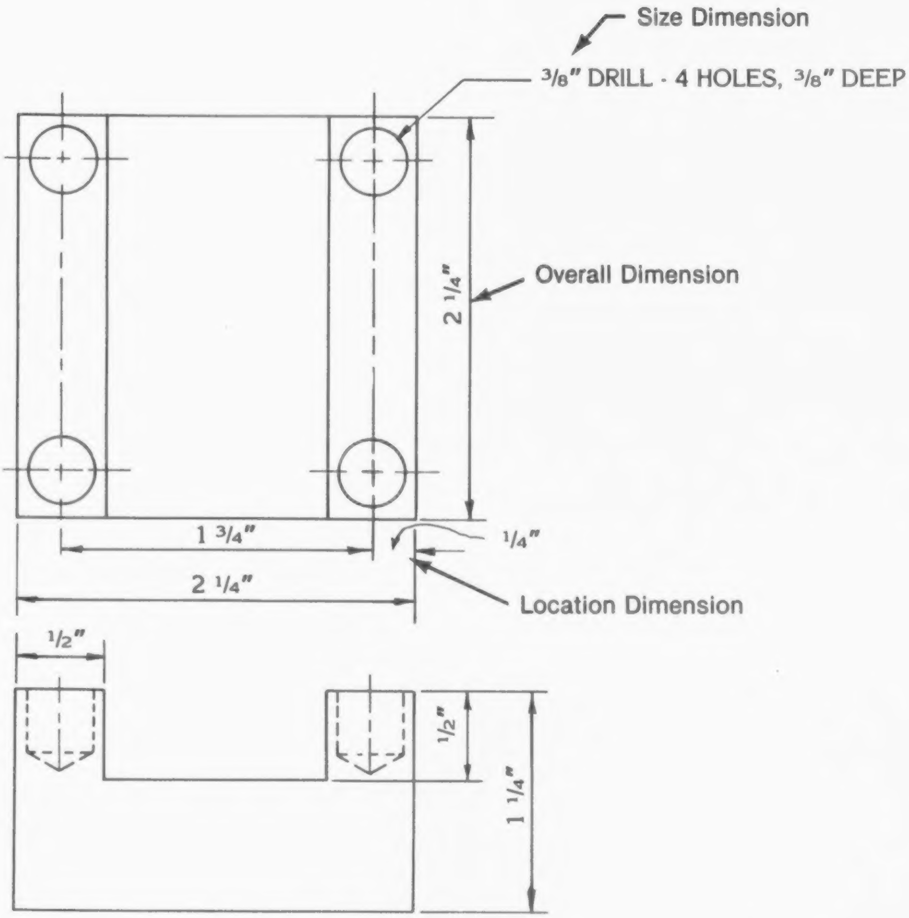
A. Overall dimension — Describes a total distance, such as the complete length, width, or thickness of an object

B. Size dimension — Gives information concerning the size of an object

C. Location dimension — Gives information concerning the location of some detail of construction, such as a hole

EXAMPLE:

FIGURE 13

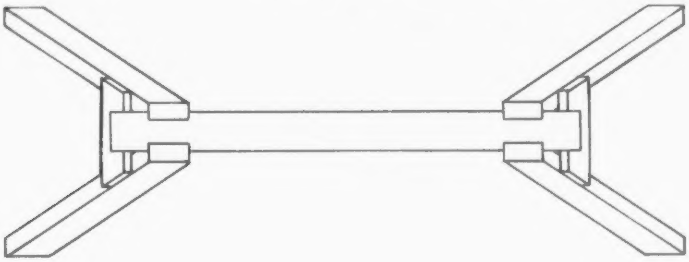

Size Dimension
3/8" DRILL - 4 HOLES, 3/8" DEEP
Overall Dimension
2 1/4"
1 3/4"
1/4"
2 1/4"
Location Dimension
1/2"
1/2"
1 1/4"

INFORMATION SHEET

VII. Major pictorial views used in the body of a drawing (Figures 14-16)

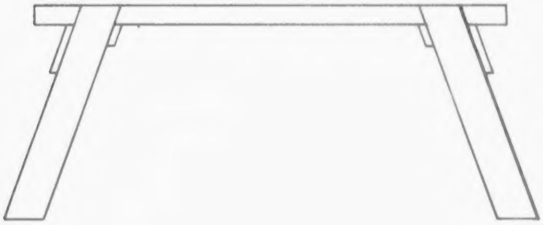
A. Top view

FIGURE 14



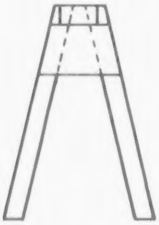
B. Front or side view

FIGURE 15



C. End view

FIGURE 16



INFORMATION SHEET

VIII. Descriptions of a cutting bill-of-materials and a shopping bill-of-materials

A. Cutting bill-of-materials — Lists and describes each item needed to construct an object

(NOTE: If you are using a prepared engineer's drawing, the bill of materials provides you with an itemized cutting list of the materials you will need for your project; however, if you have sketched your own plans, you will have to make your own cutting bill-of-materials.)

B. Shopping bill-of-materials — Lists the items that are to be purchased from the materials supply center

(NOTE: You will use your cutting bill-of-materials to write a shopping bill-of-materials. However, to be able to write your own cutting bill-of-materials and shopping bill-of-materials, you must know the units of measure and the grades and classifications of the materials you will be using. You must also be able to calculate the costs of those materials. When planning a project, always calculate the cost of the project prior to construction for a realistic cost estimate.)

IX. Facts you need to know about each item listed on a cutting bill-of-materials (Figure 17)

EXAMPLE:

FIGURE 17

Cutting Bill-of-Materials

Item	No. of Pieces	Dimensions	Description
BOTTOM	*1*	*3/4" x 7 1/2" x 30 1/2"*	*#2 WHITE PINE*
ENDS	*2*	*3/4" x 7 1/2" x 14"*	*#2 WHITE PINE*
SIDES	*2*	*3/4" x 7 1/2" x 32"*	*#2 WHITE PINE*
HANDLE	*1*	*1" ROUND x 32"*	*BIRCH DOWELL PIN*

A. Name of item

B. Number of pieces that will need to be cut of each item named

C. Dimensions of each item

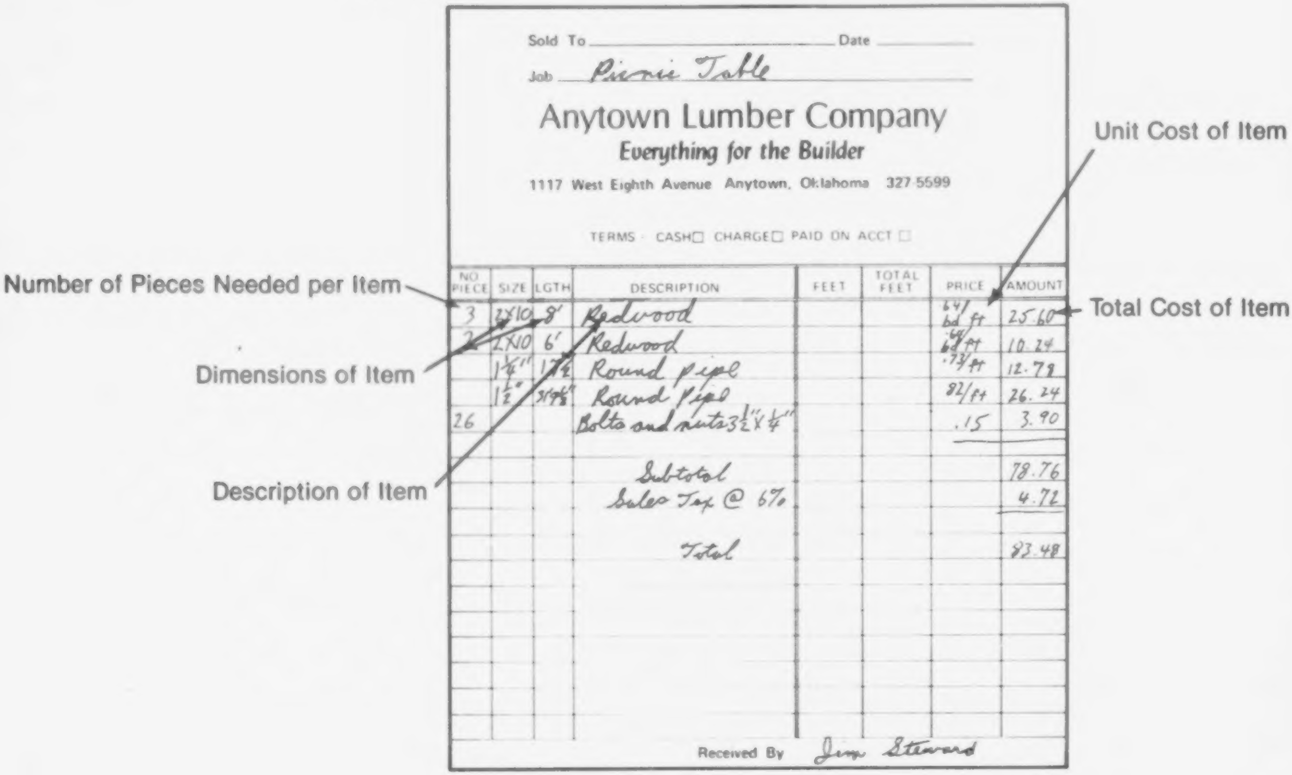
D. Description of each item

INFORMATION SHEET

X. Facts you need to know about each item listed on a shopping bill-of-materials (Figure 18)

(NOTE: Most firms have paper pads or books used for completing an order for a shopping bill-of-materials.)

FIGURE 18


Unit Cost of Item
Number of Pieces Needed per Item
Total Cost of Item
Dimensions of Item
Description of Item

Sold To ______________ Date ________

Job Picnic Table

Anytown Lumber Company

Everything for the Builder

1117 West Eighth Avenue Anytown, Oklahoma 327-5599

TERMS: CASH☐ CHARGE☐ PAID ON ACCT ☐

NO PIECE	SIZE	LGTH	DESCRIPTION	FEET	TOTAL FEET	PRICE	AMOUNT
3	2X10	8'	Redwood			.64/bd ft	25.60
2	2X10	6'	Redwood			.64/bd ft	10.24
	1¼"	17½	Round pipe			.73/ft	12.78
	1½"	31 5/8"	Round pipe			82/ft	26.24
26			Bolts and nuts 3½" X ¼"			.15	3.90
			Subtotal				78.76
			Sales Tax @ 6%				4.72
			Total				83.48

Received By Jim Steward

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INFORMATION SHEET

XI. Terms associated with material descriptions

A. Fastener — Device used to construct an object or to give stability to an object

EXAMPLES: Nail, screw, rivet, bolt

B. Lumber — Logs or timbers that have been dressed for use as structural materials

C. Softwood — Wood produced from any needle- or cone-bearing tree

(NOTE: The term *softwood* has no reference to the actual softness of the wood. Cedar, cypress, fir, pine, redwood, and spruce are examples of softwoods.)

D. Hardwood — Wood produced from any broad-leaved tree bearing its seeds in a closed cavity

(NOTE: The term *hardwood* has no reference to the actual hardness of the wood. Ash, maple, oak, pecan, cottonwood, and walnut are examples of hardwoods.)

E. Plywood — Fabricated wood product made of layers of veneer joined with adhesive (glue)

F. Veneer — Thin layer or sheet of wood glued to base material

G. Surfaced wood — Wood that has been planed to a smooth surface and uniform size

EXAMPLES: S2S is wood that has been surfaced on two sides but the edges have been left rough; S4S is wood that is surfaced on two sides and on the edges.

H. Nominal measurement — Thickness and width of board to nearest inch

EXAMPLES: 1″ × 6″; 1″ × 12″; 2″ × 4″

I. Actual measurement — Actual size of lumber after it is has been surfaced

EXAMPLES: The actual measurements of a S4S 1″ × 6″ are 3/4″ × 3 1/2″; a S4S 1″ × 12″ is actually 3/4″ × 11 1/4″; a S4S 2″ × 4″ is actually 1 1/2″ × 3 1/2″.

J. Board foot — Piece of lumber 1 inch thick, 12 inches long, and 12 inches wide

(NOTE: One board foot equals 144 cubic inches.)

K. Running foot — Foot length of material regardless of thickness and width

(NOTE: A *running foot* is sometimes referred to as a "linear foot" or a "lineal foot.")

INFORMATION SHEET

L. Square foot — A 12″ × 12″ surface regardless of thickness

M. Square — Amount of material needed to cover 100 square feet

N. Grade — Standard established for measuring and inspecting materials to ensure quality

XII. Units of measure for various lumber products

(NOTE: Lumber and certain related building materials come in basically three different units of measurement, each unit serving as the basis for pricing such materials. For example, 2×4 studs may cost 28 cents a board foot, plywood may cost 22 cents a square foot, and molding may sell for 18 cents a running foot. Also, lumber suppliers often give discounts for large-quantity orders. For instance, they may have one price per board foot and a lower price for 100 board feet [C bd. ft.] or per 1000 board feet [M bd. ft.])

A. Board foot — Boards, dimension lumber, stuctural lumber, shop and factory lumber

B. Square foot — Plywood, particle board, drywall, sheathing, paneling, certain hardwoods, milled boards, and speciality products such as flooring and ceiling tile

(NOTE: Plywood and particle board may also be bought in 4 × 8 sheets.)

C. Running foot — Molding and trim

XIII. Units of measure for various construction materials other than lumber

A. Running foot — Some steel rods, chain cable

B. Square foot — Some steel products

(NOTE: Steel priced by the square foot generally is calculated from weight per square foot.)

C. Square — Metal siding, roofing, sheet iron, shingles

D. Bundle — Lathe, sometimes shingles when a square is broken

(NOTE: Four bundles of standard 16-inch wood shingles make a square. Three bundles of asphalt shingles make a square.)

E. Weight — Steel, nails

(NOTE: Practically all metals are priced per pound but are sold by the running foot. Most nails are measured in length by the penny system, some nails are measured in length by the inch, but nails are sold by the pound.)

F. Sheet — Corrugated steel siding

(NOTE: Corrugated steel siding or roofing is 26 inches wide and comes in various lengths. Figure width 2 inches less than actual.)

INFORMATION SHEET

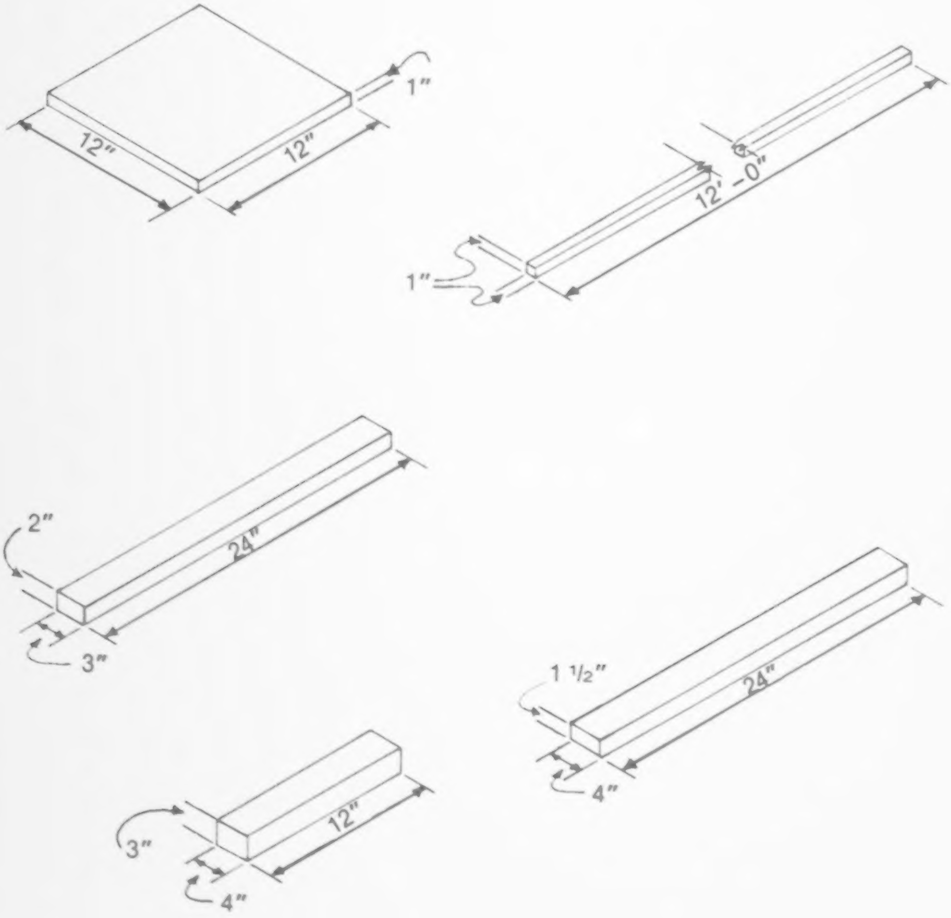
XIV. Computing quantities

A. Board feet

(NOTE: A board foot is 1 inch thick, 12 inches wide, and 1 foot long, or the equivalent. Each of the illustrations in Figure 19 is 1 board foot.)

EXAMPLE:

FIGURE 19



1. Use the formula $\frac{N \times T \times W \times L}{12}$, where N is number of pieces, T is thickness in inches, W is width in inches, and L is length in feet

INFORMATION SHEET

2. Use nominal sizes in figuring board feet, except for lumber less than 1 inch thick, which is figured as 1 inch

   EXAMPLE: A piece 1/2" × 12" × 12" is considered to be 1 board foot.

3. Round fractional board feet to next full board foot

   EXAMPLES: 1 1/3 board feet is rounded to 2 board feet.

   1 1/2 board feet is rounded to 2 board feet.

   1 3/4 board feet is rounded to 2 board feet.

   1/2 board foot is rounded to 1 board foot.

B. Square feet

(NOTE: A square foot is an area equal to a square with 12-inch sides.)

1. Use the formula $A = W \times L$, where A is area, W is width, and L is length

   EXAMPLE: To figure the square footage in a 4′ × 8′ sheet of plywood —

$$\begin{aligned} A &= W \times L \\ &= 4' \times 8' \\ &= 32 \text{ square feet} \end{aligned}$$

2. To find number of units needed (sheets, tiles, pieces, etc.), divide number of square feet to be covered by total square feet in one unit in which material is sold

3. Round fractional units to next whole unit in which material is sold

   EXAMPLE: To figure the plywood decking for a roof 20′-0" × 41′-0", use the formula $A = W \times L$ to get 820 total square feet to be covered. Divide this number by 32 (total square feet in one sheet of plywood) to get 25 5/8. Round this fractional unit to 26. Order twenty-six sheets of plywood to cover the area with no allowance for waste.

C. Running feet — Measure the distance in which the required product will be used

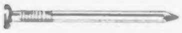
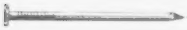
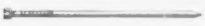
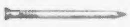
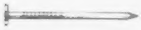
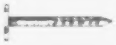
(NOTE: Molding and trim are sold in standard lengths of even-foot measurements. Most suppliers mix the lengths to get as close as possible to the amount ordered. For example, a supplier would probably ship 108 or 110 feet of base if an order called for 107 feet. The buyer is charged for the amount delivered, not for the amount ordered.)

INFORMATION SHEET

XV. Types of wood fasteners and their uses

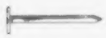
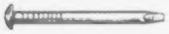
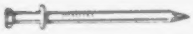
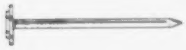
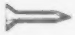
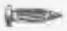
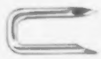
A. Nails (Table 1)

TABLE 1: Types of nails

Type	Use
Common 	Used to nail sheeting, shiplap, and fencing (NOTE: A common nail is thicker than a box nail)
Box 	Used to nail siding
Finishing 	Used to nail interior finishes, ceilings, and cabinet work
Flooring 	Used to nail flooring
Shingle 	Used to nail shingles
Roofing 	Used to nail rolled roofing and composition shingles

INFORMATION SHEET

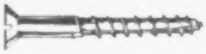
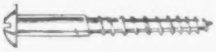
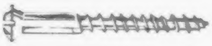
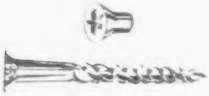
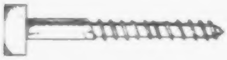
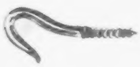
TABLE 1 (continued)

Type	Use
Plasterboard 	Used to nail plasterboard
Hinge 	Used to fasten hinges
Duplex 	Used to construct forms
Lead-head 	Used to nail galvanized iron to wood
Concrete 	Used to fasten wood to concrete
Masonry 	Used to fasten wood to bricks or masonry
Wire staple 	Used in fence construction

INFORMATION SHEET

B. Wood screws (Table 2)

TABLE 2: Types of wood screws

Type	Use
Flat-head 	Used to attach or fasten pieces of wood together when screw head must be flush with surface
Round-head 	Used to prevent splitting material; can be spaced to give an ornamental effect
Oval-head 	Used in cabinet work to attach hinges; can be spaced to give an ornamental effect
Phillips-head 	Used in production work; considered to have greater drawing power than a regular screw head
Lag 	Used to fasten wood to brick or concrete
Screw hook 	Used to attach and suspend articles

INFORMATION SHEET

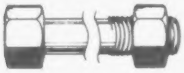
C. Bolts (Figures 20-22)

1. Machine — Used to attach wood to wood in heavy wood construction

   (NOTE: Machine bolts are used in constructing such things as livestock feeders, gates, and trusses for buildings. They are useful because their heads can be held with a wrench.)

   EXAMPLE:

FIGURE 20

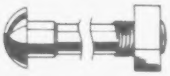


2. Carriage — Used to attach metal to wood

   (NOTE: Carriage bolts are considered to be *the* wood-type bolt because of their square shanks under their round, oval heads.)

   EXAMPLE:

FIGURE 21

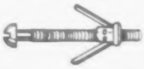


3. Toggle — Used to join small objects to walls and other objects

   (NOTE: The toggle bolt has a spreading head nut that opens as it passes through a wall.)

   EXAMPLE:

FIGURE 22



PLAN PROJECT CONSTRUCTION
UNIT IV

ASSIGNMENT SHEET #1 — COMPLETE A CHECKLIST FOR PLANNING A PROJECT FOR CONSTRUCTION

NAME ______________________________ SCORE ____________

The question of whether or not you will be developing a suitable construction project can be resolved by asking yourself a number of questions about the project. Making a checklist or completing a checklist such as the one below will help you tally your answers to determine the project's suitability. For the project to be appropriate as a learning experience, it is not necessary that all the questions be answered yes. However, if a significant number of questions are answered no, the project may well be inappropriate, and you should consider a different one.

Select a project for construction and then complete the following checklist to determine the suitability of the project. Write an "X" under the appropriate column for each of the questions below.

Project selected: ____

____

Question	Yes	No
Is the project challenging but still within the range of your competencies?		
Will you learn new abilities rather than repeat present skills?		
Will this project provide an opportunity for creativity?		
Are you interested and enthusiastic enough to complete the project?		
Are adequate plans available? If no, must you develop your own plans?		
Is there an opportunity to improve the project design for your application?		
Can the project be completed within the time available?		
Is the cost of the project within your limits?		

ASSIGNMENT SHEET #1

Question	Yes	No
Have you discussed the project with your instructor?		
Have you discussed the project with your parents?		
Have you examined all available references?		
Are the necessary materials available?		
Are the necessary tools available?		

PLAN PROJECT CONSTRUCTION
UNIT IV

ASSIGNMENT SHEET #2 — READ AND INTERPRET DRAWINGS

NAME ______________________________ SCORE ____________

Signs and symbols play important parts in our lives. Anyone who has watched football realizes it is important to know what the game officials mean when they give certain signs with their arms. In baseball, the course of a game is often determined by the signs the team manager flashes to the third-base coach and the third-base coach passes to the players.

A drawing or sketch also uses signs or symbols to communicate ideas and instructions to someone else. A construction crew working on a farm building uses a series of complex plans to show everything—from how the foundation should be placed to the exact location of the electrical circuits. The beginning vocational agriculture student may use a simple plan showing the dimensions of a sawhorse or shop stand. However complicated or simple, your work will be done more quickly and precisely if you know how to read a plan and follow its instructions.

Much practice is necessary for developing skills in reading and interpreting a drawing. The following drawings and questions will provide such practice. Review the Information Sheet, Sections III through VII, study each of the drawings in this assignment sheet, and then answer the questions with each drawing.

PART I: **Reading the title block**

Reading the notes in the title block on a plan is the first step in trying to find out what the plan is all about and what is important to know. The title block is a small box that is usually placed in the lower right-hand corner of the drawing, but may be seen in other places on a drawing. Study the title block in the drawing on the following page, and then write the correct answers in the blanks provided below.

A. What is the name of the object to be constructed? ______________________

B. What company did the drawing? ______________________

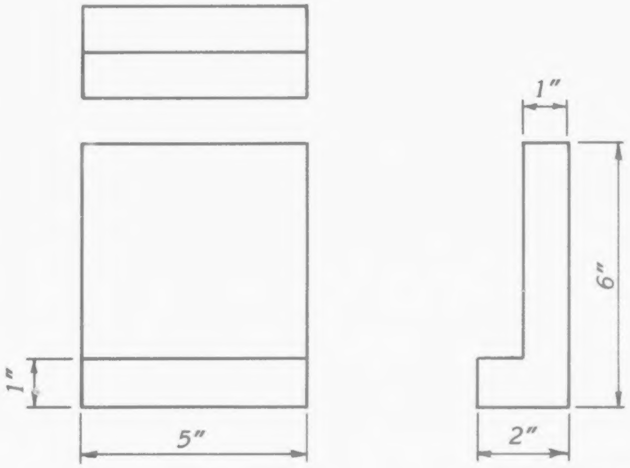
C. Who was the draftsman? ______________________

D. What is the scale of the drawings? ______________________

E. When was the last revision made on the drawing? ______________________

ASSIGNMENT SHEET #2

REV	DESCRIPTION	DATE
A	CHANGED WIDTH TO 5 IN.	4/1/70
B	CHANGED STOCK TO OAK, WAS WALNUT	4/3/70



DRAWN BY: W. WATOSH	
CHECKED BY: O.E.S.	
MAT'L: OAK	
SCALE: 1/4"=1"	
BOOKEND	
CO.: JONES CORP.	
DWG. NO.: C3218	

Plans were originally drawn to scale noted; however, drawings have been reduced and scale may no longer be accurate.

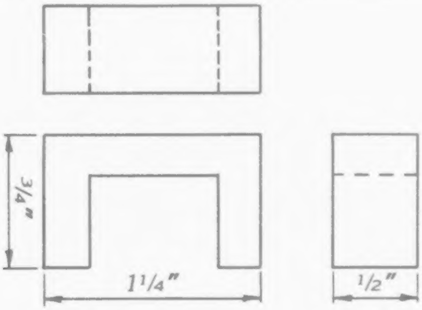
PART II: **Reading the dimensions on a drawing**

Study the drawing below to determine the dimensions of the object represented. Write the correct answers in the blanks provided.

A. What is the height of the object? ______________________________

B. What is the width of the object? ______________________________

C. What is the depth of the object? ______________________________

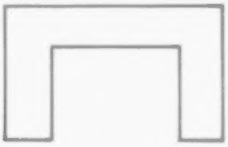


ASSIGNMENT SHEET #2

PART III: **Recognizing pictorial views**

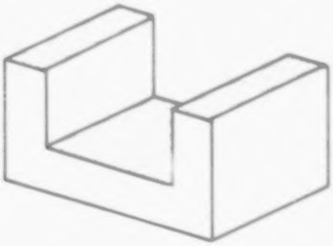
Review the Information Sheet, Section VII, study the following drawings, and then follow the directions with each of the questions below.

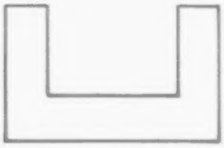
A. Suppose you are standing directly in front of the object represented below and you cannot see any other part. Which view (top, side, or end) would you be seeing? Write the correct answer in the blank below the drawing.



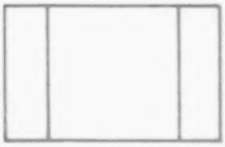
____

B. Which view (1, 2, or 3) would be considered to be the *front* view of the object represented below? Circle the number below the correct view.

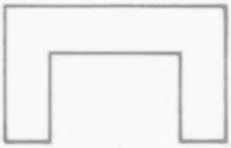




1.



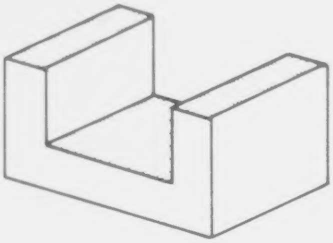
2.

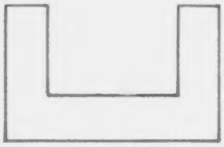


3.

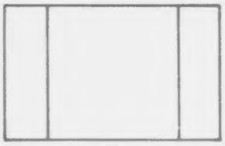
ASSIGNMENT SHEET #2

C. Which view (1, 2, or 3) would be considered to be the *top* view of the object represented below? Circle the number below the correct view.

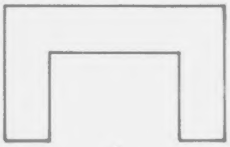




1.

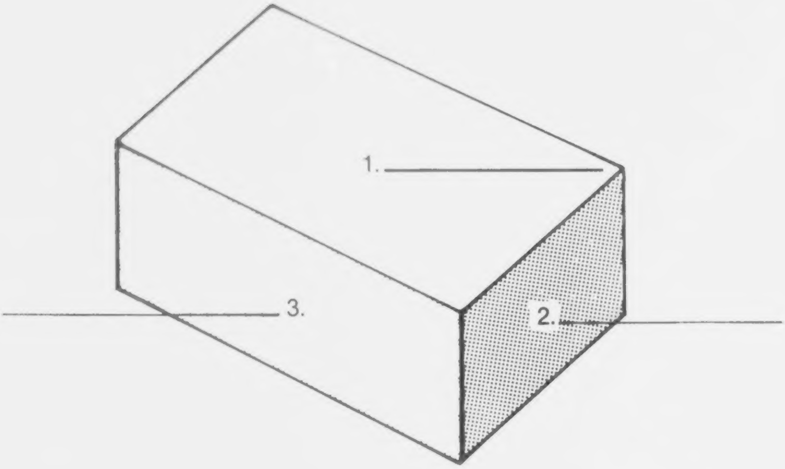


2.



3.

D. Label each view in the drawing below. Write "top," "front," or "end" in the blanks on the drawing.



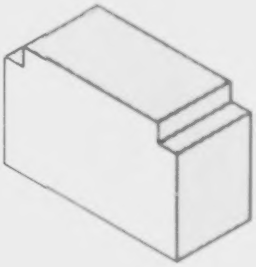
ASSIGNMENT SHEET #2

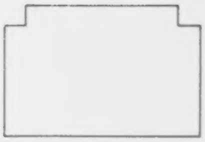
E. Study the drawings below, and then answer the following questions.

1. Which view is represented by the drawing labeled "1"? ______________________

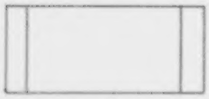
2. Which view is represented by the drawing labeled "2"? ______________________

3. Which view is represented by the drawing labeled "3"? ______________________

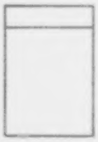




1.



2.



3.

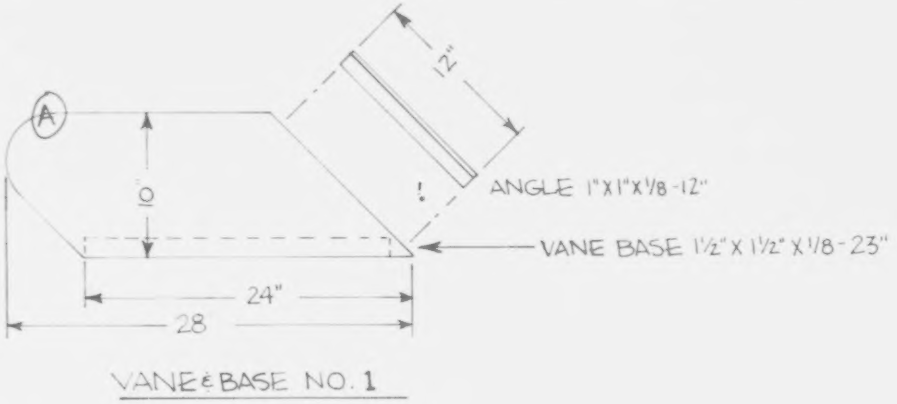
PLAN PROJECT CONSTRUCTION
UNIT IV

ASSIGNMENT SHEET #3 — LABEL LINES USED IN A DRAWING

NAME ______________________________ SCORE ______________

When making drawings for blueprints, engineers use standard lines to give the reader specific information about the object represented. Each line has a particular meaning, and to read blueprints or to draw your own plans, you must be able to understand the meaning of those lines.

Review the Information Sheet, Section V, and then study the drawing on the following page. Find at least eight basic lines used in the drawing and label each line with a letter from A to H. Then write the name of the line beside the corresponding letter on the blanks below. See the following example.



A. Object Line

A. ______________________________

B. ______________________________

C. ______________________________

D. ______________________________

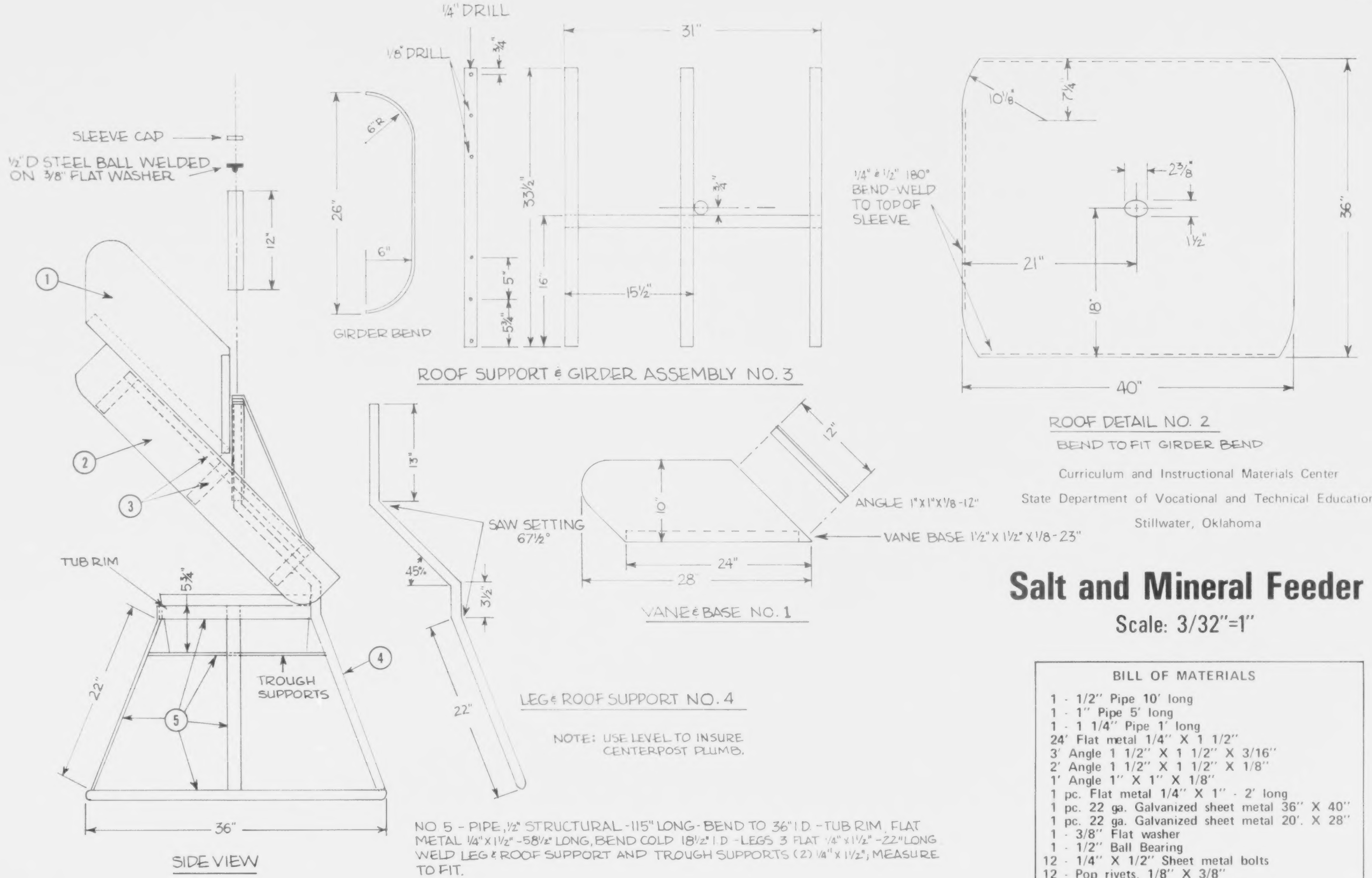
E. ______________________________

F. ______________________________

G. ______________________________

H. ______________________________

03:26


1/4" DRILL
1/8" DRILL
3/4"
31"
SLEEVE CAP
1/2" D STEEL BALL WELDED ON 3/8" FLAT WASHER
12"
26"
6"R
6"
GIRDER BEND
33 1/2"
16"
5"
5 3/4"
15 1/2"
3/4"
ROOF SUPPORT & GIRDER ASSEMBLY NO. 3
10 1/8"
7 1/4"
2 3/8"
1/4" & 1/2" 180° BEND-WELD TO TOP OF SLEEVE
21"
1 1/2"
18"
36"
40"
ROOF DETAIL NO. 2
BEND TO FIT GIRDER BEND
1
2
3
TUB RIM
5 3/4
4
TROUGH SUPPORTS
22"
5
36"
SIDE VIEW
13"
SAW SETTING 67 1/2°
45%
3 1/2"
22"
LEG & ROOF SUPPORT NO. 4
12"
10"
ANGLE 1"X1"X1/8-12"
VANE BASE 1 1/2"X 1 1/2"X 1/8-23"
24"
28"
VANE & BASE NO. 1

NOTE: USE LEVEL TO INSURE CENTERPOST PLUMB.

Curriculum and Instructional Materials Center
State Department of Vocational and Technical Education
Stillwater, Oklahoma

Salt and Mineral Feeder

Scale: 3/32"=1"

BILL OF MATERIALS

1 - 1/2" Pipe 10' long
1 - 1" Pipe 5' long
1 - 1 1/4" Pipe 1' long
24' Flat metal 1/4" X 1 1/2"
3' Angle 1 1/2" X 1 1/2" X 3/16"
2' Angle 1 1/2" X 1 1/2" X 1/8"
1' Angle 1" X 1" X 1/8"
1 pc. Flat metal 1/4" X 1" - 2' long
1 pc. 22 ga. Galvanized sheet metal 36" X 40"
1 pc. 22 ga. Galvanized sheet metal 20'. X 28"
1 - 3/8" Flat washer
1 - 1/2" Ball Bearing
12 - 1/4" X 1/2" Sheet metal bolts
12 - Pop rivets, 1/8" X 3/8"
1 - Rubber Tub, 50 lb. capacity
3 - 1/4" X 1" Sheet metal bolts

NO 5 - PIPE, 1/2" STRUCTURAL -115" LONG - BEND TO 36" I.D. - TUB RIM, FLAT METAL 1/4" X 1 1/2" - 58 1/2" LONG, BEND COLD 18 1/2" I.D - LEGS 3 FLAT 1/4" X 1 1/2" - 22" LONG WELD LEG & ROOF SUPPORT AND TROUGH SUPPORTS (2) 1/4" X 1 1/2"; MEASURE TO FIT.

Plans were originally drawn to scale noted; however, drawings have been reduced and scale may no longer be accurate.

PLAN PROJECT CONSTRUCTION
UNIT IV

ASSIGNMENT SHEET #4 — DRAW A THREE-VIEW SKETCH

NAME ______________________________ SCORE ____________

A sketch is a simple visual plan that helps you develop and illustrate ideas and relationships. The sketch helps translate an abstract idea or concept into a concrete view of the shape, size, and layout of an object. Although the sketch is simple, it is not done carelessly. The sketch should illustrate the proportions of the object and give the details and dimensions.

Study the following information and, in the spaces provided, draw a three-view sketch of the rectangular block described. Be sure to show the scale you are using for each drawing and to label the dimensions on the drawing.

A. Make a three-view sketch of a rectangular block that is 5 inches long × 2 inches wide × 1 inch thick.

Scale: ____

ASSIGNMENT SHEET #4

B. Make a three-view sketch of a rectangular block that is 12 inches long × 4 inches wide × 2 inches thick.

Scale: ____________________

PLAN PROJECT CONSTRUCTION
UNIT IV

ASSIGNMENT SHEET #5 — CALCULATE BOARD FEET AND THE COST OF LUMBER SOLD BY THE BOARD FOOT

NAME ________________________ SCORE ____________

Lumber is ordered and paid for in board feet; therefore, if you are going to order lumber and calculate cost, you must be able to figure board feet and the cost of lumber sold by the board foot.

PART I: **Calculate board feet**

A board foot is lumber that is 1 inch thick, 12 inches wide, and 1 foot long. To determine board feet, use the formula

$$\frac{N \times T \times W \times L}{12},$$

where N is the number of pieces, T is the thickness in inches, W is the width in inches, and L is the length in feet.

For example, if five pieces of lumber are needed and each piece is to be 1″ × 6″ × 12′, then

$$\frac{5 \times 1'' \times 6'' \times 12'}{12} = 30 \text{ Board Feet.}$$

Calculate the total board feet in each of the problems below. Write the correct answers in the blanks provided. Please show your work.

A. One piece 1″ × 10″ × 10′ = ____________

B. One piece 1″ × 4″ × 12′ = ____________

C. One piece 2″ × 6″ ×8′ = ____________

D. Two pieces 1″ × 12″ × 10′ = ____________

E. Five pieces 1″ × 8″ × 8′ = ____________

F. Forty pieces 2″ × 4″ × 8′ = ____________

G. Ten pieces 4″ × 6″ ×10′ = ____________

H. Fifty pieces 1″ × 4″ × 12′ = ____________

I. One piece 2″ × 4″ × 18′ = ____________

J. One piece 1″ × 12″ × 12′ = ____________

ASSIGNMENT SHEET #5

PART II: **Caculate cost**

To calculate the cost of lumber you are ordering, first determine the number of board feet ordered, and then multiply the number of board feet by the cost per board foot. For example, if you order one piece of lumber that is 2" × 8" × 12' and the lumber costs $.30 per board foot, then

$$\frac{1 \times 2'' \times 8'' \times 12'}{12} = 16 \text{ Board Feet}$$

16 Bd Ft × $.30 = $4.80 = Cost of Lumber.

Calculate the cost of the lumber listed in the following problems. Write your answers in the blanks provided and show your work in the spaces provided.

A. If you order four pieces of lumber that are 2" × 10" × 12' at a cost of $.35 per board foot, the cost will equal $____________.

B. If you order twenty-two pieces of lumber that are 2" × 4" × 16' at a cost of $.38 per board foot, the cost will equal $____________.

C. If you order twelve pieces of lumber that are 1" × 12" × 12' at a cost of $.45 per board foot, the cost will equal $____________.

PLAN PROJECT CONSTRUCTION
UNIT IV

ASSIGNMENT SHEET #6 — CALCULATE THE COST OF MATERIALS OTHER THAN LUMBER

NAME ______________________________ SCORE ______________

After you have figured the cost of the lumber, you must to find the cost of the other materials you may need in order to calculate the total cost of the project. Costs of different materials are determined with different formulas. Those formulas are discussed below and are followed by exercises to give you practice in using each formula.

PART I: **Calculating the cost of steel**

To calculate the cost of steel sold by weight per square foot, first determine the number of square feet in the area to be covered, using the formula

L × W = Square Feet to Be Covered,

where L is the length and W is the width of the area. Then use weight tables to look up the weight of the steel per square foot and multiply the total weight by the price per pound.

For example, if you need one piece of 16-gauge sheet metal to cover a 3′ × 8′ area and the metal weighs 2.5 pounds per square foot and costs $.40 per pound, then

3′ × 8′ = 24 Square Feet to Be Covered
24 Sq Ft × 2.5 Lb = 60 Lb
60 Lb × $.40 = $24.00.

To calculate the cost of steel sold by the running foot, multiply the length of the product by the number of pieces of the product required to find the number of running feet needed. Then use weight tables to look up the weight of the metal per running foot and multiply the total weight by the price per pound.

For example, if you need to find the cost of twenty pieces of ½-inch round steel stock that are each 10 feet long and weigh 1.49 pounds per running foot and cost $.35 per pound, then

20 × 10′ = 200 Running Feet
200 Running Feet × 1.49 Lb = 298 Lb
296 Lb × $.35 = $104.30.

Calculate the cost of the materials needed for each of the projects described on the following page. Write your answers in the blanks provided and show your work in the spaces provided. Use the tables at the end of the assignment sheet when necessary.

ASSIGNMENT SHEET #6

A. Find the cost of five pieces of 18-gauge, 3′ × 8′ hot-rolled sheet steel that cost $.30 per pound.

Cost = ____________

B. Determine the cost of one hundred pieces of 1″ × 1″ × 1/4″ angle iron that are 20 feet long and cost $.30 per pound.

Cost = ____________

C. Find the cost of ten pieces of 1/2-inch round stock that are 10 feet long and cost $.35 per pound.

Cost = ____________

ASSIGNMENT SHEET #6

D. Calculate the cost of five pieces of 5/8-inch concrete reinforcing bars that are 20 feet long and cost $.10 per pound.

Cost = ____________

E. Calculate the cost of two pieces of 3-inch channel iron that are 10 feet long and cost $.35 per pound.

(NOTE: This channel iron weighs 5 pounds per foot.)

Cost = ____________

ASSIGNMENT SHEET #6

PART II: **Calculating the cost of sheet iron**

To calculate the cost of sheet iron, first determine the number of square feet in the area to be covered, using the formula

L × W = Square Feet to Be Covered.

Then calculate the number of square feet that each sheet will cover, divide the square footage to be covered by the square footage in each sheet to find the number of sheets needed, and multiply the number of sheets needed by the price per sheet.

For example, if you are going to cover a shed that is 8 feet wide and 10 feet long with sheet roofing that is 26 inches wide and 10 feet long and costs $3.00 per sheet, then

8′ × 10′ = 80 Sq Ft Needed to Be Covered
2′ × 10′ = 20 Sq Ft per Sheet
80 Sq Ft ÷ 20 Sq Ft = 4 Sheets
4 Sheets × $3.00 = $12.00.

Calculate the cost of the sheet iron needed for each of the projects described below. Write your answers in the blanks provided and show your work. Remember a 2-inch overlap is needed when installing sheet iron.

A. Find the cost of roofing a calf shed with a roof that is 12 feet wide and 24 feet long. The sheet roofing is 26 inches wide and 12 feet long and is priced at $4.00 per sheet.

Cost = ____________

B. Calculate the cost of roofing a hay barn with a roof that is 60 feet wide and 96 feet long. The sheet roofing is 26 inches wide and 10 feet long and is priced at $3.00 per sheet.

Cost = ____________

ASSIGNMENT SHEET #6

Hot-Rolled Sheet Steel
Commercial Quality Prime Open Hearth Low Carbon
(Manufacturers Standard Gauge)

Gauge and size in inches	Est wt per sheet
No. 7 (3/16")	
Wt per sq ft 7.50	
36 × 96	180.0
36 × 120	225.0
36 × 144	270.0
36 × 240	450.0
42 × 96	210.0
42 × 120	262.5
42 × 144	315.0
42 × 240	525.0
48 × 96	240.0
48 × 120	300.0
48 × 144	360.0
48 × 240	600.0
60 × 96	300.0
60 × 120	375.0
60 × 144	450.0
60 × 240	750.0
72 × 96	336.0
72 × 120	420.0
72 × 144	504.0
72 × 240	840.0
Over 72" See Plates	
No. 8 (.1644")	
Wt per sq ft 6.875	
36 × 96	165.0
36 × 120	206.3
36 × 144	247.5
36 × 192	330.0
42 × 96	192.5
42 × 120	240.6
42 × 144	288.8
42 × 192	385.0
48 × 96	220.0
48 × 120	275.0
48 × 144	333.0
48 × 192	440.0
54 × 96	247.5
54 × 120	309.4
54 × 144	371.3
54 × 192	495.0
60 × 96	275.0
60 × 120	343.8
60 × 144	412.5
60 × 192	550.0
72 × 96	330.0
No. 8 (.1644")(cont'd)	
Wt per sq ft 6.875	
72 × 120	412.5
72 × 144	495.0
72 × 192	660.0
No. 10 (.1345")	
Wt per sq ft 5.625	
36 × 96	135.0
36 × 108	151.9
36 × 120	168.8
36 × 144	202.5
40 × 96	150.0
40 × 120	187.5
42 × 96	157.5
42 × 120	196.9
42 × 144	236.3
48 × 96	180.0
48 × 120	225.0
48 × 144	270.0
54 × 96	202.5
54 × 120	253.1
60 × 96	225.0
60 × 120	281.3
60 × 144	337.5
72 × 96	270.0
72 × 120	337.5
72 × 144	405.0
72 × 192	540.0
No. 11 (.1196")	
Wt per sq ft 5.00	
36 × 96	120.0
36 × 120	150.0
36 × 144	180.0
42 × 96	140.0
42 × 120	175.0
42 × 144	210.0
48 × 96	160.0
48 × 120	200.0
48 × 144	240.0
54 × 144	270.0
60 × 96	200.0
60 × 120	250.0
60 × 144	300.0
No. 11 (.1196") (cont'd)	
Wt per sq ft 5.00	
72 × 120	300.0
72 × 144	360.0
72 × 192	480.0
No. 12 (.1046")	
Wt per sq ft 4.375	
36 × 96	105.0
36 × 120	131.3
36 × 144	157.5
40 × 96	116.7
40 × 120	145.8
42 × 96	122.5
42 × 120	153.1
42 × 144	183.8
48 × 96	140.0
48 × 120	175.0
48 × 144	210.0
48 × 156	227.5
54 × 96	157.5
54 × 120	196.9
54 × 192	315.0
60 × 96	175.0
60 × 120	218.8
60 × 144	262.5
60 × 168	306.3
72 × 96	210.0
72 × 120	262.5
72 × 144	315.0
72 × 192	420.0
No. 14 (.0747")	
Wt per sq ft 3.125	
36 × 96	75.0
36 × 120	93.8
36 × 144	112.5
40 × 96	83.3
40 × 120	104.2
42 × 96	87.5
42 × 120	109.4
42 × 144	131.3
48 × 96	100.0
48 × 120	125.0
48 × 144	150.0
No. 14 (.0747") (cont'd)	
Wt per sq ft 3.125	
48 × 156	162.5
54 × 96	112.5
54 × 120	140.6
54 × 156	182.8
60 × 96	125.0
60 × 120	156.3
60 × 144	187.5
60 × 192	250.0
72 × 96	150.0
72 × 120	187.5
72 × 144	225.0
No. 16 (.0598")	
Wt per sq ft 2.50	
36 × 96	60.0
36 × 120	75.0
36 × 144	90.0
40 × 96	66.7
40 × 120	83.3
42 × 96	70.0
42 × 120	87.5
42 × 144	105.0
48 × 96	80.0
48 × 120	100.0
48 × 144	120.0
48 × 156	130.0
54 × 96	90.0
54 × 120	112.5
54 × 156	146.3
60 × 96	100.0
60 × 120	125.0
60 × 144	150.0
60 × 168	175.0
No. 18 (.0478")	
Wt per sq ft 2.00	
36 × 96	48.0
36 × 120	60.0
42 × 96	56.0
42 × 120	70.0
48 × 96	64.0
48 × 120	80.0
48 × 144	96.0

ASSIGNMENT SHEET #6

Channels—Structural

Depth of channel inches	Weight per ft lbs	Thickness of web	Width flange inches
3	4.1	0.170	1.410
	5.0	0.258	1.498
	6.0	0.356	1.596
4	5.4	0.180	1.580
	7.25	0.320	1.720
5	6.7	0.190	1.750
	9.0	0.325	1.885
6	8.2	0.200	1.920
	10.5	0.314	2.034
	13.0	0.437	2.157
7	9.8	0.210	2.090
	12.25	0.314	2.194
	14.75	0.419	2.299
8	11.5	0.220	2.260
	13.75	0.303	2.343
	18.75	0.487	2.527
9	13.4	0.230	2.430
	15.0	0.285	2.485
	20.0	0.448	2.648
10	15.3	0.240	2.600
	20.0	0.379	2.739
	25.0	0.526	2.886
	30.0	0.673	3.033
12	20.7	0.280	2.940
	25.0	0.387	3.047
	30.0	0.510	3.170
13	31.8	0.375	4.000
	50.0	0.787	4.412
15	33.9	0.400	3.400
	40.0	0.520	3.520
	50.0	0.716	3.716
18	45.8	0.500	4.000

Rounds

Size in inches	Weight per ft
1/4	0.167
5/16	0.261
3/8	0.376
7/16	0.511
1/2	0.668
9/16	0.845
5/8	1.043
3/4	1.502
7/8	2.044
1	2.670
1 1/8	3.379
1 1/4	4.173
1 3/8	5.05
1 1/2	6.01
1 5/8	7.051
1 3/4	8.18
1 7/8	9.39
2	10.68
2 1/8	12.06
2 1/4	13.52
2 3/8	15.06
2 1/2	16.69
2 5/8	18.40
2 3/4	20.20
3	24.03
3 1/4	28.21
3 1/2	32.71
3 3/4	37.55
4	42.73
4 1/4	48.23
4 1/2	54.08
4 3/4	60.25
5	66.76
5 1/4	73.60
5 1/2	80.78
5 3/4	88.29
6	96.13

ASSIGNMENT SHEET #6

Concrete Reinforcing Bars

BAR SIZES			
Old (inches)	New (numbers)	Weight pounds per ft	Diameter inches
1/4	2	.167	.250
3/8	3	.376	.375
1/2	4	.668	.500
5/8	5	1.043	.625
3/4	6	1.502	.750
7/8	7	2.044	.875
1	8	2.670	1.000
1	9	3.400	1.128
1 1/8	10	4.303	1.270
1 1/4	11	5.313	1.410

Angles—Structural

Size in inches	Weight per ft lbs	Size in inches	Weight per ft lbs	Size in inches	Weight per ft lbs
3 × 2 × 3/16	3.07	5/16	8.2	3/4	23.6
1/4	4.10	3/8	9.8	6 × 3 1/2 × 5/16	9.8
5/16	5.00	7/16	11.3	3/8	11.7
3/8	5.90	1/2	12.8	1/2	15.3
1/2	7.70	5/8	15.7	6 × 4 × 5/16	10.3
3 × 2 1/2 × 1/4	4.50	3/4	18.5	3/8	12.3
5/16	5.60	5 × 3 × 1/4	6.6	7/16	14.3
3/8	6.60	5/16	8.2	1/2	16.2
1/2	8.50	3/8	9.8	5/8	20.0
3 1/2 × 3 × 1/4	5.40	7/16	11.3	3/4	23.6
5/16	6.60	1/2	12.8	7/8	27.2
3/8	7.90	5 × 3 1/2 × 5/16	8.7	6 × 6 × 3/8	14.9
1/2	10.20	3/8	10.4	7/16	17.2
3 1/2 × 3 1/2 × 1/4	5.80	7/16	12.0	1/2	19.6
5/16	7.20	1/2	13.6	5/8	24.2
3/8	8.50	5/8	16.8	3/4	28.7
7/16	9.80	3/4	19.8	7/8	33.1
1/2	11.10	3 × 3 × 3/16	3.71	1	37.4
4 × 3 × 1/4	5.80	1/4	4.90	7 × 4 × 3/8	13.6
5/16	7.20	5/16	6.10	1/2	17.9
3/8	8.50	3/8	7.20	5/8	22.1
7/16	9.80	7/16	8.30	8 × 4 × 1/2	19.6
1/2	11.10	1/2	9.40	8 × 6 × 1/2	23.0
5/8	13.60	3 1/2 × 2 1/2 × 1/4	4.90	5/8	28.5
4 × 3 1/2 × 1/4	6.2	5/16	6.10	3/4	33.8
5/16	7.7	3/8	7.20	1	44.2
3/8	9.1	1/2	9.40	8 × 8 × 1/2	26.4
7/16	10.6	5 × 5 × 3/8	12.3	5/8	32.7
1/2	11.9	1/2	16.2	3/4	38.9
4 × 4 × 1/4	6.6	5/8	20.0	7/8	45.0
				1	51.0

ASSIGNMENT SHEET #6

Angles—Bar Sizes

Size in inches	Weight per ft lbs
1 × 1 × 1/8	.80
1/8	1.16
1/4	1.49
1 1/8 × 1 1/8 × 1/8	.90
1 1/4 × 1 1/4 × 1/8	1.01
3/16	1.48
1/4	1.92
1 3/8 × 7/8 × 1/8	.91
3/16	1.32
1 1/2 × 1 1/4 × 3/16	1.64
1 1/2 × 1 1/2 × 1/8	1.23
3/16	1.80
1/4	2.34
1 3/4 × 1 1/4 × 1/8	1.23
1 3/4 × 1 3/4 × 1/8	1.44
3/16	2.12
1/4	2.77
2 × 1 1/4 × 3/16	1.96
1/4	2.55
2 × 1 1/2 × 1/8	1.44
3/16	2.12
1/4	2.77
2 × 2 × 1/8	1.65
3/16	2.44
1/4	3.19
5/16	3.92
3/8	4.70
2 1/4 × 1 1/2 × 3/16	2.28
2 1/2 × 1 1/2 × 3/16	2.44
1/4	3.19
5/16	3.92
2 1/2 × 2 × 3/16	2.75
1/4	3.62
5/16	4.50
3/8	5.30
2 1/2 × 2 1/2 × 3/16	3.07
1/4	4.10
5/16	5.00
3/8	5.90
1/2	7.70

1160

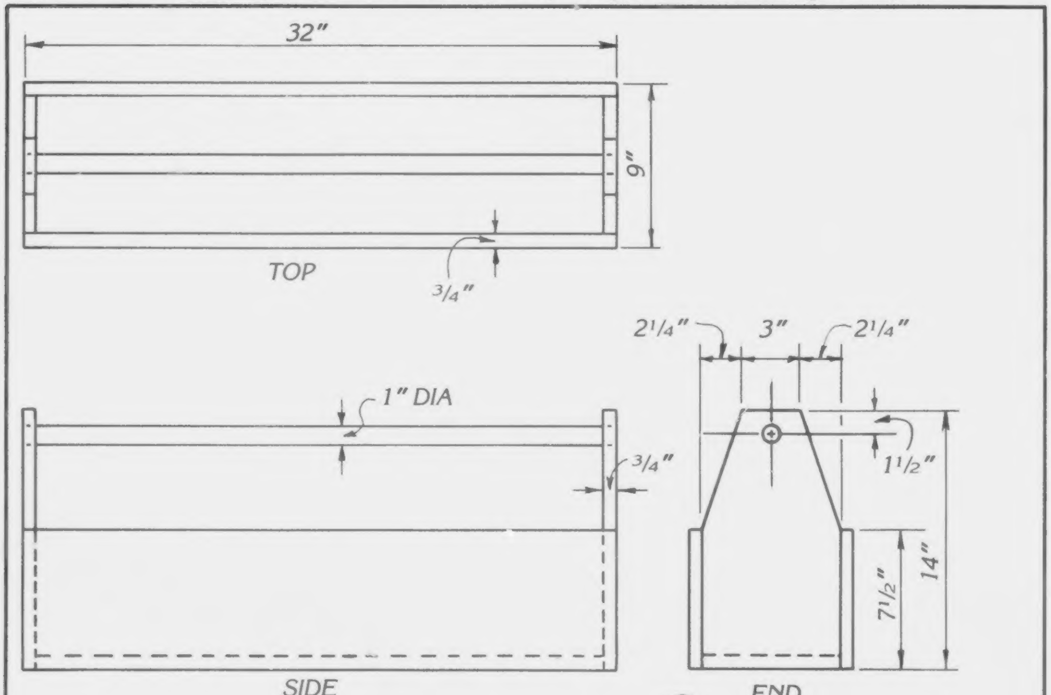
PLAN PROJECT CONSTRUCTION
UNIT IV

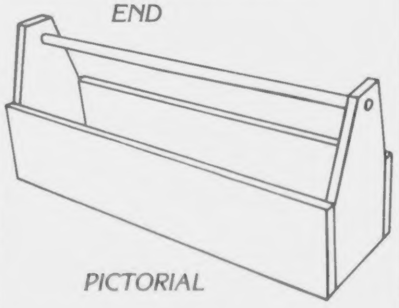
ASSIGNMENT SHEET #7 — DETERMINE CUTTING BILL-OF-MATERIALS

NAME ______________________________ SCORE ______________

The cutting bill-of-materials lists each item and the exact dimension each item is to be cut. To save time and money during project construction, always write a cutting bill-of-materials before cutting or sawing materials.

Study the plan below and the cutting bill-of-materials for a wooden tool carrier; the cutting bill-of-materials with the plan lists the items needed for constructing the tool carrier and the exact dimensions of each item. Observe how the cutting bill-of-materials is written, and then study the plans on the following pages to determine the materials needed to construct each of the projects. Write a cutting bill-of-materials in the space provided following each plan.





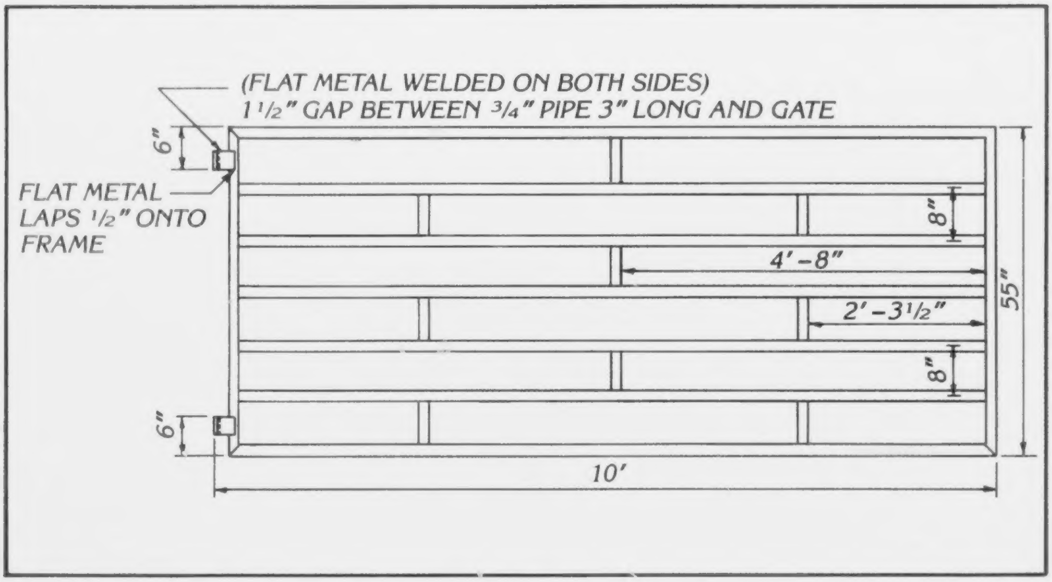
Cutting Bill-of-Materials

Item	No. of Pieces	Dimensions	Description
BOTTOM	*1*	*3/4" x 7 1/2" x 30 1/2"*	*#2 WHITE PINE*
ENDS	*2*	*3/4" x 7 1/2" x 14"*	*#2 WHITE PINE*
SIDES	*2*	*3/4" x 7 1/2" x 32"*	*#2 WHITE PINE*
HANDLE	*1*	*1" ROUND x 32"*	*BIRCH DOWELL PIN*

ASSIGNMENT SHEET #7

A. **Gate**

(NOTE: Assume that the gate will be constructed out of 1-inch square tubing, there will be four pieces of flat metal that are 1/4" × 3" × 3" for the hinges, and the gate's top and bottom rails are cut at a 45-degree angle and are measured to the longest point [outside].)


(FLAT METAL WELDED ON BOTH SIDES)
1 1/2" GAP BETWEEN 3/4" PIPE 3" LONG AND GATE
6"
FLAT METAL LAPS 1/2" ONTO FRAME
8"
4'–8"
55"
2'–3 1/2"
8"
6"
10'

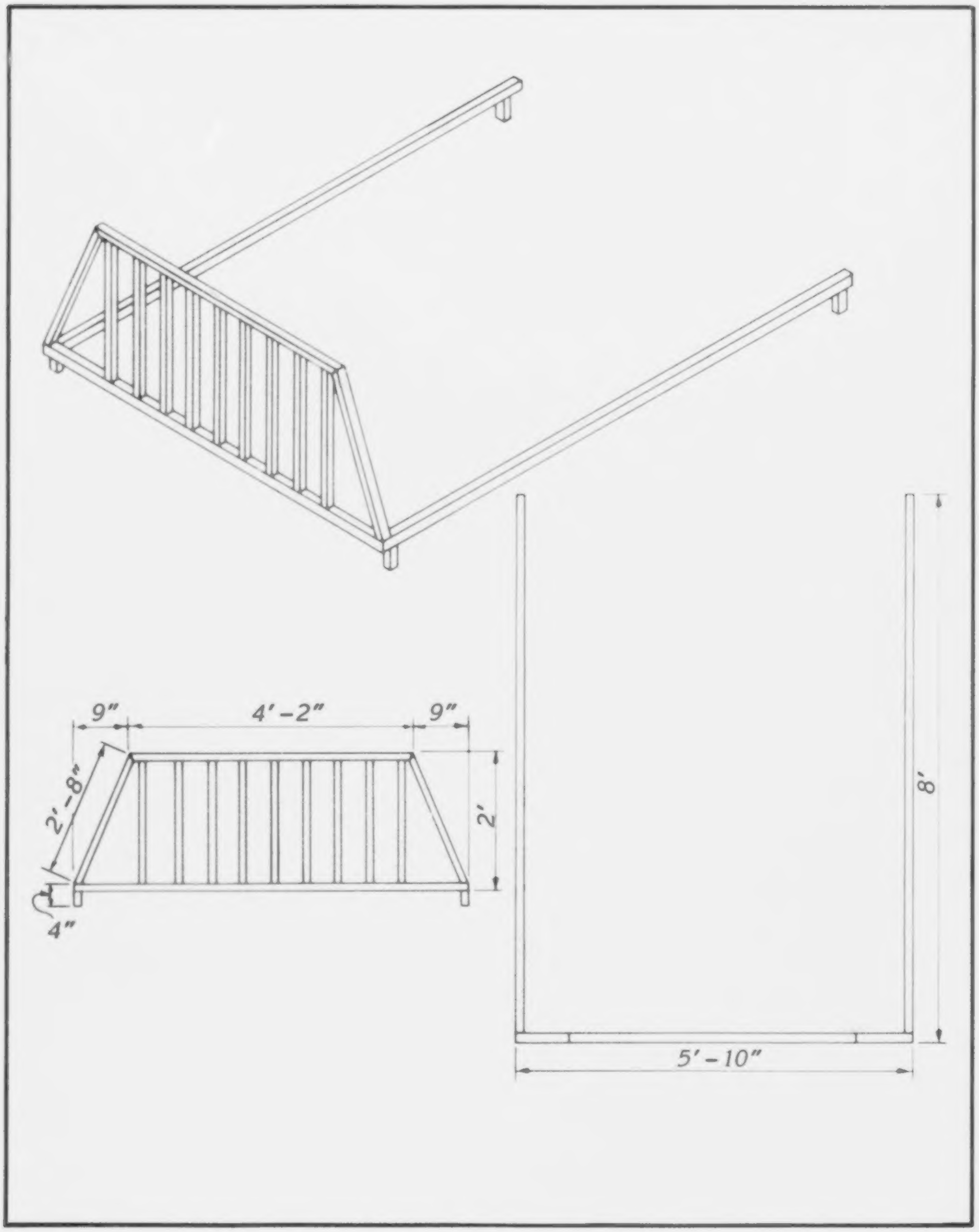
Cutting Bill-of-Materials

Item	No. of Pieces	Dimensions	Description

ASSIGNMENT SHEET #7

B. **Headache rack**

(NOTE: Assume that this is a frame that sits on a pickup and that the 4-inch pieces that go in holes are made from 1½-inch square tubing. Also assume that the side rails and stakes are 1½-inch tubing and that all other pieces are 1-inch square tubing.)



ASSIGNMENT SHEET #7

Cutting Bill-of-Materials

Item	No. of Pieces	Dimensions	Description

PLAN PROJECT CONSTRUCTION
UNIT IV

ASSIGNMENT SHEET #8 — DETERMINE COST OF A PROJECT

NAME ______________________ SCORE __________

The shopping bill-of-materials lists the items that are to be purchased from the materials supply center. When planning a project, it is wise to calculate the cost of the project prior to construction in order to get a realistic cost estimate. It is important to remember that there will be some waste. You cannot always buy metal or lumber of the exact dimensions you need. For some project construction, it is advisable to order an extra percentage for waste. A common practice for projects built with lumber is to add 10 percent.

Study the plan and the cutting bill-of-materials for the wooden tool carrier in Assignment Sheet #7, then study the sample shopping bill-of-materials for the tool carrier that is shown on the next page. Observe how the shopping bill-of-materials is written, and then study the plans on the following pages to determine the materials needed to construct the projects. Write a shopping bill-of-materials for each of the projects in the forms provided.

(NOTE: Construction of the tool carrier will require about 124 inches of 1" × 8" lumber, but the standard sizes are 10 feet and 12 feet long. Therefore it was necessary to order the 12-foot board, or 8 board feet. Likewise, the dowel rod comes in a standard 36-inch length and must be cut to 32 inches. The plan does not show the number and size of screws, so this decision was made after consulting a screw-size chart. If a wood adhesive is desired and none was available, a small container should be included in the bill of materials. A few finishing nails will probably be used to assemble the 'project prior to adding the screws. Other items needed would be wood filler for the countersunk nails and a finishing material such as paint.)

ASSIGNMENT SHEET #8

Shopping bill-of-materials for wooden tool carrier

Sold To Johnny Doe Date 9-1-86

Job Tool Carrier

Anytown Lumber Company

Everything for the Builder

1117 West Eighth Avenue Anytown, Oklahoma 327-5599

TERMS - CASH ☑ CHARGE ☐ PAID ON ACCT ☐

NO. PIECE	SIZE	LGTH	DESCRIPTION	FEET	TOTAL FEET	PRICE	AMOUNT
1	1X8	12'	#2 White Pine		8	.25	2.00
1	1"rd	3'	Birch Dowel Rod			.54	.54
18			1 1/2 #12 FH Bright Steel Screws			.02	.36
1			1/2 pt. Kelley green Paint			1.50	1.50
1			Small tube Clear woodfiller			.30	.30
2			Sandpaper 1/0 and 4/0			.25	.50
			Subtotal				5.20
			Sales Tax @ 6%				.31
			Total				5.51

Received By Jim Steward

ASSIGNMENT SHEET #8

A. Using the drawings for the picnic table on the next page, complete the shopping bill-of-materials below. Determine the total cost of the project. Use current prices. Call a local dealer and get all prices needed.

(NOTE: Use redwood lumber. Also consider using a wood sealer to protect lumber from the weather.)

Shopping bill-of-materials for picnic table

Sold To ______________________ Date __________

Job ______________________________

Anytown Lumber Company

Everything for the Builder

1117 West Eighth Avenue Anytown, Oklahoma 327-5599

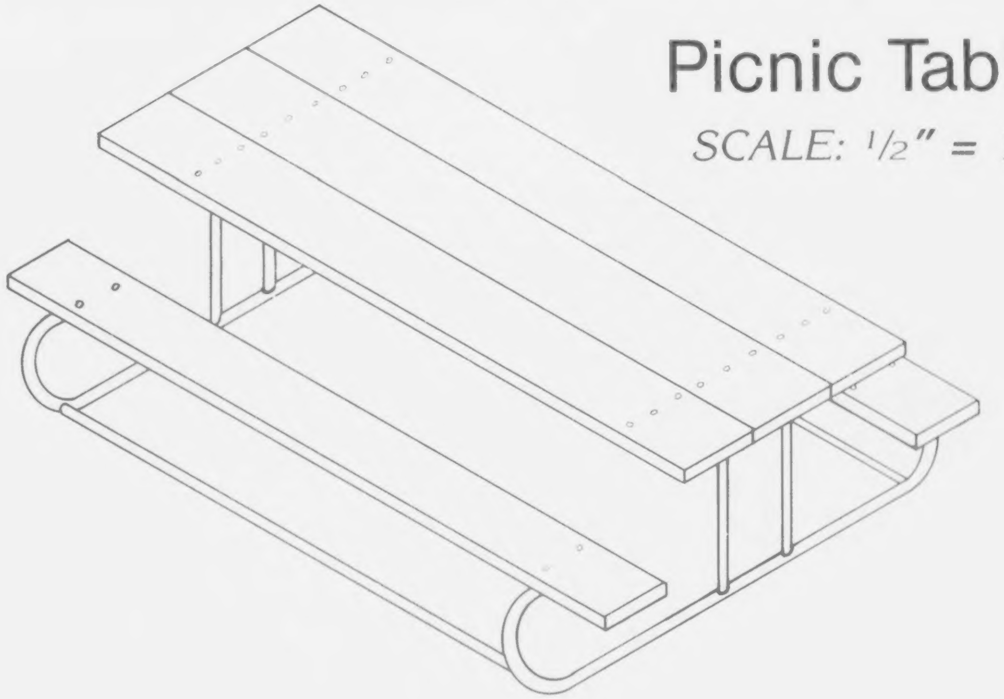
TERMS - CASH☐ CHARGE☐ PAID ON ACCT.☐

NO. PIECE	SIZE	LGTH	DESCRIPTION	FEET	TOTAL FEET	PRICE	AMOUNT

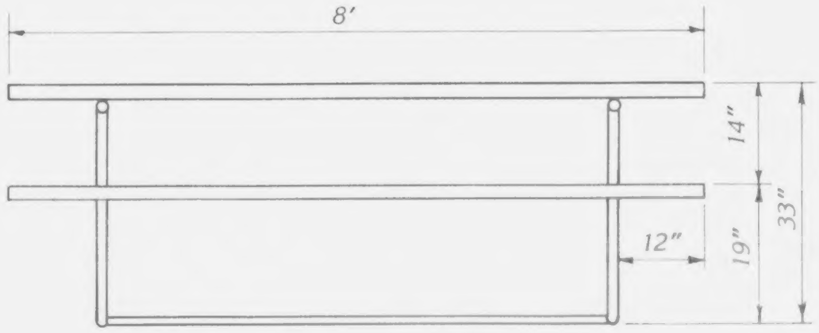
Received By

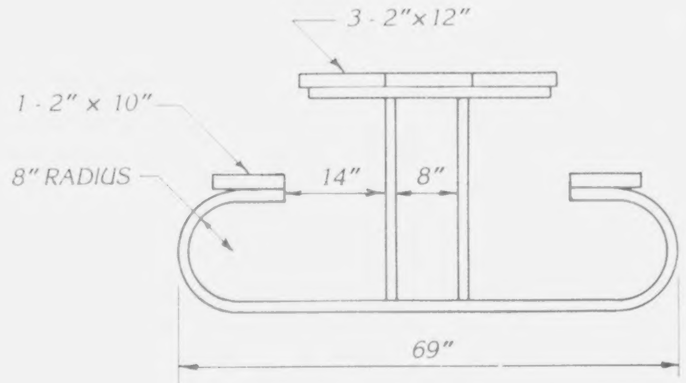
Picnic Table

SCALE: 1/2" = 1'



Bill of Materials
4 PIECES OF 1 1/2" PIPE 30 1/4" LONG
2 PIECES OF 1 1/2" PIPE 5' – 10 1/4" LONG
2 PIECES OF 1 1/4" PIPE 5' – 9" LONG
2 PIECES OF 1 1/4" PIPE 7' LONG
3 BOARDS 2" × 10" × 8'
2 BOARDS 2" × 10" × 8'
26 BOLTS & NUTS 3 1/2" × 1/4"





DRAWN BY: JOHN McEACHERN

CURRICULUM AND INSTRUCTIONAL MATERIALS CENTER
STATE DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION
STILLWATER, OKLAHOMA

ASSIGNMENT SHEET #8

B Using the drawings for the hay feeder on the next page, complete the shopping bill-of-materials below. Determine the total cost of the project. Use current prices. Call a local dealer and get all prices needed.

(NOTE: Consider using lumber if landing mats are not available. Also determine approximate amount of electrodes needed. Consider use of a primer and paint to protect metal from the weather.)

Shopping bill-of-materials for hay feeder

Sold To ____________________ Date ________

Job ______________________________

Anytown Lumber Company

Everything for the Builder

1117 West Eighth Avenue Anytown, Oklahoma 327-5599

TERMS - CASH☐ CHARGE☐ PAID ON ACCT.☐

NO. PIECE	SIZE	LGTH	DESCRIPTION	FEET	TOTAL FEET	PRICE	AMOUNT

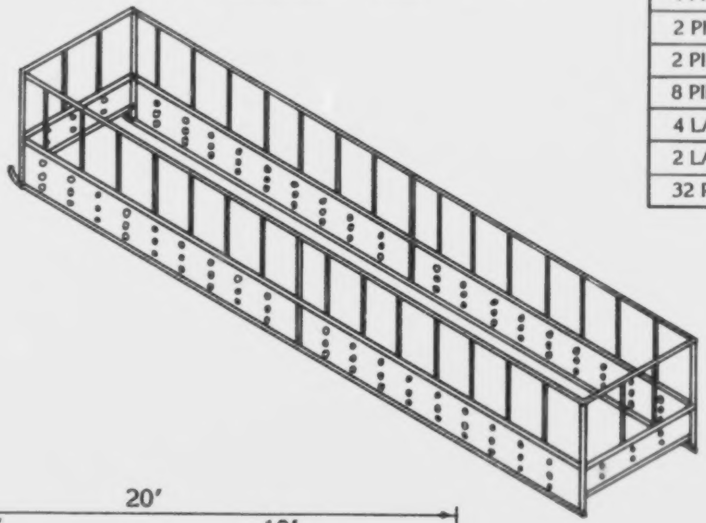
Received By

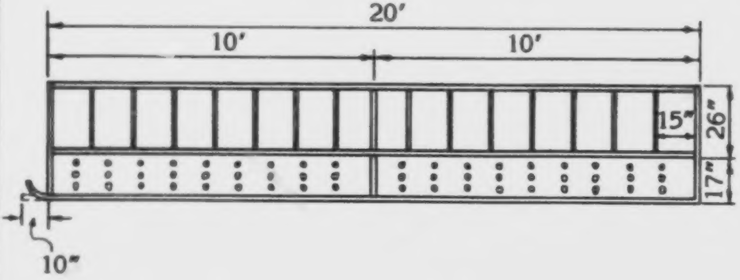
ASSIGNMENT SHEET #8

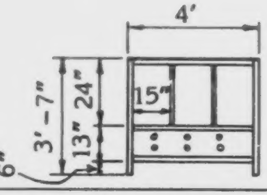
HAY FEEDER

SCALE: 3/16″ = 1′

Bill of Materials
4 PIECES OF 2" PIPE 19′-8" LONG
2 PIECES OF 2" PIPE 20′-10" LONG
4 PIECES OF 2" PIPE 3′-5" LONG
2 PIECES OF 2" PIPE 22 1/4" LONG
2 PIECES OF 2" PIPE 15 1/4" LONG
8 PIECES OF 2" PIPE 3′-8" LONG
4 LANDING MATS 10′ × 16"
2 LANDING MATS 3′-8" × 10"
32 PIECES OF 5/8" OR 3/4" SUCKER ROD 22" LONG







DRAWN BY: JOHN McEACHERN

CURRICULUM AND INSTRUCTIONAL MATERIALS CENTER
STATE DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION
STILLWATER, OKLAHOMA

PLAN PROJECT CONSTRUCTION
UNIT IV

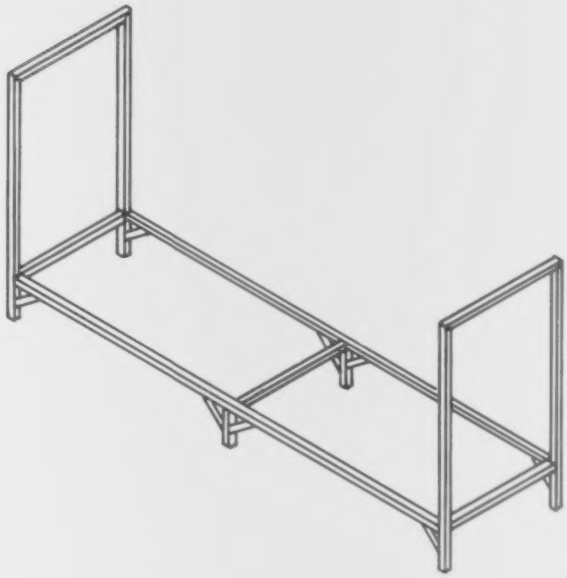
ASSIGNMENT SHEET #9 — COMPLETE PLANS FOR A PROJECT

NAME ______________________________ SCORE ______________

Each hour spent in useful planning can save hours in shop construction time and it may save expensive mistakes. Plan the steps for systematic construction procedures. Study the plan carefully and determine the logical place to begin. Pay special attention to jobs that require the same procedure or the same tools so that the most efficient sequence can be arranged for the operations.

Using the knowledge you have acquired about sketching and drawing, basic line types, symbols, and bills of materials, make a drawing of the wood-rack project shown below. Then, complete a cutting bill-of-materials and a shopping bill-of-materials. After completing the bills of materials, prepare a step-by-step outline for construction of the project. Be sure to include an estimate of the cost of consumable materials, such as electrodes, nails, paint, etc.

Wood rack



ASSIGNMENT SHEET #9

PART I

Complete plans for construction of a wood rack. Design the rack to hold one rick of wood. In the space provided below, draw the end, side, and top views of the wood rack. Be sure to fill in the blank showing the scale you are using for your drawings.

Scale ____________

ASSIGNMENT SHEET #9

PART II

Using the plans you drew for the wood rack, determine the cutting bill-of-materials for the project. Write the list of materials you will need and their exact dimensions on the form below.

Cutting Bill-of-Materials			
Item	No. of Pieces	Dimensions	Description

ASSIGNMENT SHEET #9

PART III

Using the cutting bill-of-materials you wrote on the previous page, write a shopping bill-of-materials to determine the cost of the project. Write your shopping bill-of-materials on the form below.

Sold To ______________________ Date __________

Job ______________________________

Anytown Lumber Company

Everything for the Builder

1117 West Eighth Avenue Anytown, Oklahoma 327-5599

TERMS · CASH☐ CHARGE☐ PAID ON ACCT.☐

NO. PIECE	SIZE	LGTH	DESCRIPTION	FEET	TOTAL FEET	PRICE	AMOUNT

Received By

ASSIGNMENT SHEET #9

PART IV

Prepare a step-by-step outline for construction of the wood rack. The outline should include the equipment needed for completing the project, the procedures for cutting the materials into proper lengths, and the steps for constructing the rack.

PLAN PROJECT CONSTRUCTION
UNIT IV

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1 — Evaluated to the satisfaction of the instructor

Assignment Sheet #2

PART I

A. Bookend

B. Jones Corp.

C. W. Watosh

D. ¼" = 1"

E. 4/3/70

PART II

A. ¾"

B. 1¼"

C. ½"

PART III

A. End

B. 1

C. 2

ANSWERS TO ASSIGNMENT SHEETS

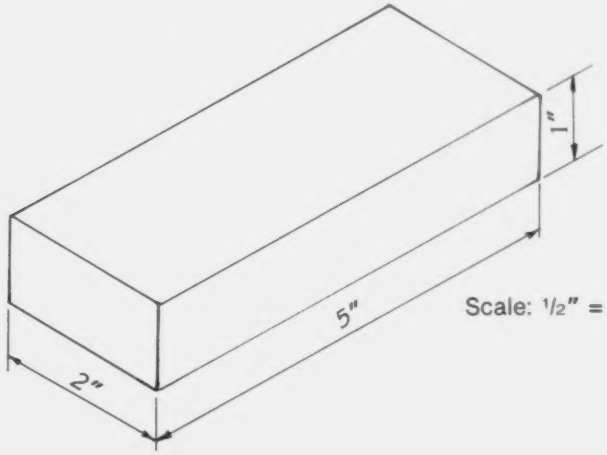
D. 1. Top
   2. End
   3. Front or side

E. 1. Front or side
   2. Top
   3. End

Assignment Sheet #3 — Evaluated to the satisfaction of the instructor

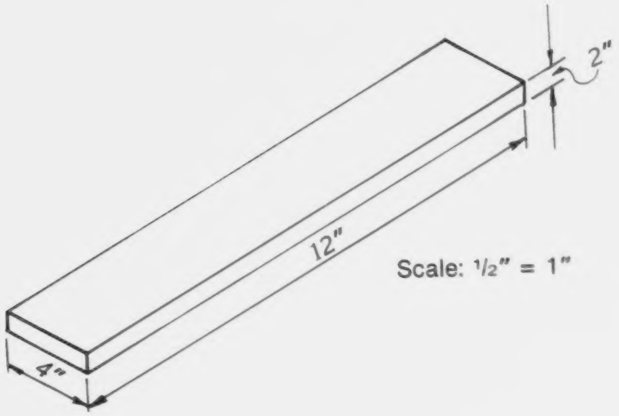
Assignment Sheet #4 — Evaluated to satisfaction of instructor, but suggested sketches are shown below

A.



Scale: 1/2" = 1"

B.



Scale: 1/2" = 1"

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #5

PART I

A. $\frac{1 \times 1'' \times 10'' \times 10'}{12} = 8.33$ Board Feet

B. $\frac{1 \times 1'' \times 4'' \times 12'}{12} = 4$ Board Feet

C. $\frac{1 \times 2'' \times 6'' \times 8'}{12} = 8$ Board Feet

D. $\frac{2 \times 1'' \times 12'' \times 10'}{12} = 20$ Board Feet

E. $\frac{5 \times 1'' \times 8'' \times 8'}{12} = 26.67$ Board Feet

F. $\frac{40 \times 2'' \times 4'' \times 8'}{12} = 213.33$ Board Feet

G. $\frac{10 \times 4'' \times 6'' \times 10'}{12} = 200$ Board Feet

H. $\frac{50 \times 1'' \times 4'' \times 12'}{12} = 200$ Board Feet

I. $\frac{1 \times 2'' \times 4'' \times 18'}{12} = 12$ Board Feet

J. $\frac{1 \times 1'' \times 12'' \times 12'}{12} = 12$ Board Feet

PART II

A. $\frac{4 \times 2'' \times 10'' \times 12'}{12} = 80$ Board Feet × \$ .35 = \$28.00

B. $\frac{22 \times 2'' \times 4'' \times 16'}{12} = 234.67$ Board Feet × \$ .38 = \$89.17

C. $\frac{12 \times 1'' \times 12'' \times 12'}{12} = 144$ Board Feet × \$ .45 = \$64.80

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #6

PART I

A. 5 × 3′ × 8′ = 120 Sq Ft
120 Sq Ft × 2.0 Lb = 240 Lb
240 Lb × $ .30 = $72.00

B. 100 × 20′ = 2000 Running Feet
2000 Running Feet × 1.49 Lb = 2980 Lb
2980 Lb × $ .30 = $894.00

C. 10 × 10′ = 100 Running Feet
100 Running Feet × 0.668 Lb = 66.8 Lb
66.8 Lb × $ .35 = $23.38

D. 5 × 20′ = 100 Running Feet
100 Running Feet × 1.043 Lb = 104.3 Lb
104.3 Lb × $ .10 =$10.43

E. 2 × 10′ = 20 Running Feet
20 Running Feet × 5 Lb = 100 Lb
100 Lb × $ .35 = $35.00

PART II

A. 12′ × 24′ = 288 Sq Ft
2′ × 12′ = 24 Sq Ft per Sheet
288 Sq Ft ÷ 24 Sq Ft = 12 Sheets
12 Sheets × $4.00 = $48.00 Sheets

B. 60′ × 96′ = 5760 Sq Ft
2′ × 10′ = 20 Sq Ft per Sheet
5760 Sq Ft ÷ 20 Sq Ft = 288 Sheets
288 Sheets × $3.00 = $864.00

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #7

A.

Cutting Bill-of-Materials

Item	No. of Pieces	Dimensions	Description
TOP AND BOTTOM RAILS	*2*	*9'-9½" LONG*	*1" SQUARE TUBING*
ENDS	*2*	*55" LONG*	*1" SQUARE TUBING*
INSIDE RAILS	*5*	*9'-7" LONG*	*1" SQUARE TUBING*
SPACERS	*9*	*8" LONG*	*1" SQUARE TUBING*
HINGE PLATES	*4*	*¼" x 3" x 3"*	*FLAT METAL*
HINGE PIPES	*2*	*3" LONG*	*¾" PIPE*

B.

Cutting Bill-of-Materials

Item	No. of Pieces	Dimensions	Description
SIDE RAILS	*2*	*8' LONG*	*1½" SQUARE TUBING*
FRONT RAIL	*1*	*5'-10" LONG*	*1½" SQUARE TUBING*
WINDOW BARS	*9*	*1'-9½" LONG*	*1" SQUARE TUBING*
SIDE BARS	*2*	*2'-8" LONG*	*1" SQUARE TUBING*
TOP BAR	*1*	*4'-2" LONG*	*1" SQUARE TUBING*
STAKES	*4*	*4" LONG*	*1½" SQUARE TUBING*

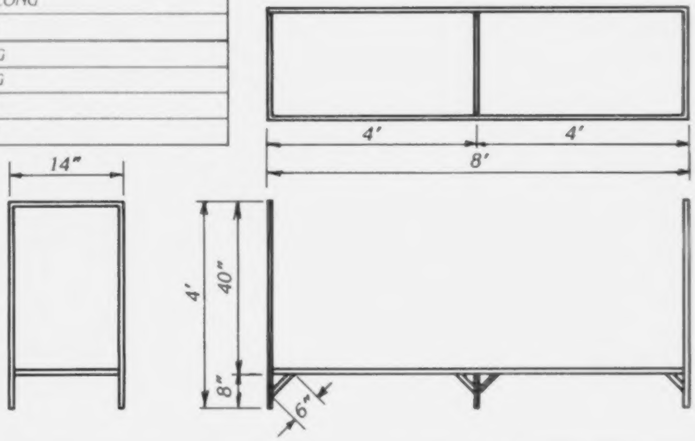
ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #8 — Evaluated to the satisfaction of the instructor

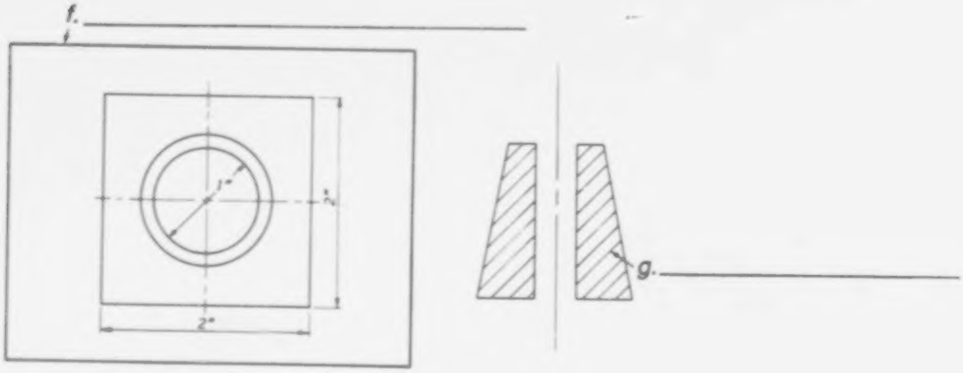
Assignment Sheet #9 — Evaluated to the satisfaction of the instructor

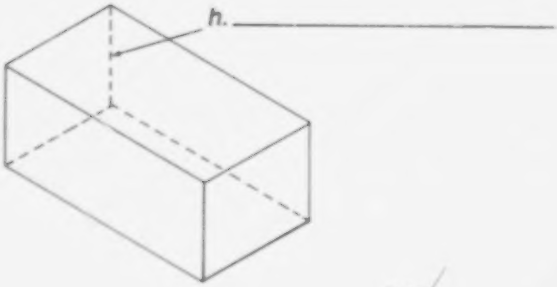
(NOTE: Answers will vary because the student may wish to use pipe instead of square tubing; however, the following are examples of dimensions and a bill of materials that might be used for the project.)

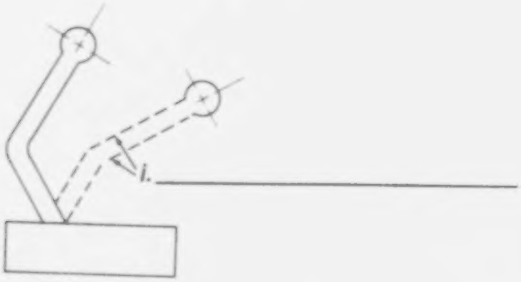
Bill of Materials
2 PIECES OF 1" SQ TUBING 7' - 10" LONG
4 PIECES OF 1" SQ TUBING 4' LONG
2 PIECES OF 1" SQ TUBING 14" LONG
3 PIECES OF 1" SQ TUBING 12" LONG
8 PIECES OF 1" SQ TUBING 6" LONG
2 PIECES OF 1" SQ TUBING 8" LONG

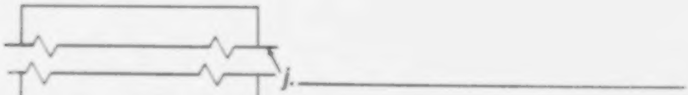


TEST









TEST

6. Match to their correct descriptions types of dimensions used in the body of a drawing. Write the correct numbers in the blanks.

_____a. Describes a total distance, such as the complete length, width, or thickness of an object

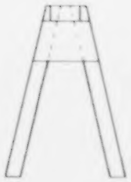
_____b. Gives information concerning the location of some detail of construction, such as a hole

_____c. Gives information concerning the size of an object

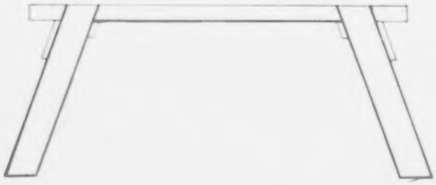
1. Overall dimension
2. Size dimension
3. Location dimension

7. Identify the major pictorial views used in the body of a drawing. Write the correct names in the blanks.

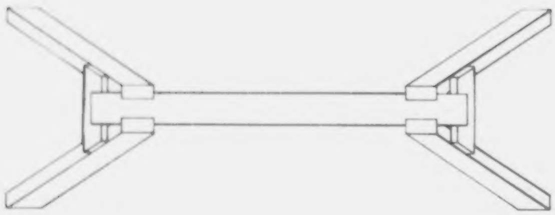
Top view **Front or side view** **End view**



a. ______________________________



b. ______________________________



c. ______________________________

TEST

8. Distinguish between the description of a cutting bill-of-materials and the description of a shopping bill-of-materials. Write an "X" in the blank before the description of a cutting bill-of-materials.

   _____a. Lists and describes each item needed to construct an object

   _____b. Lists the items that are to be purchased from the materials supply center

9. State facts you need to know about each item listed on a cutting bill-of-materials.

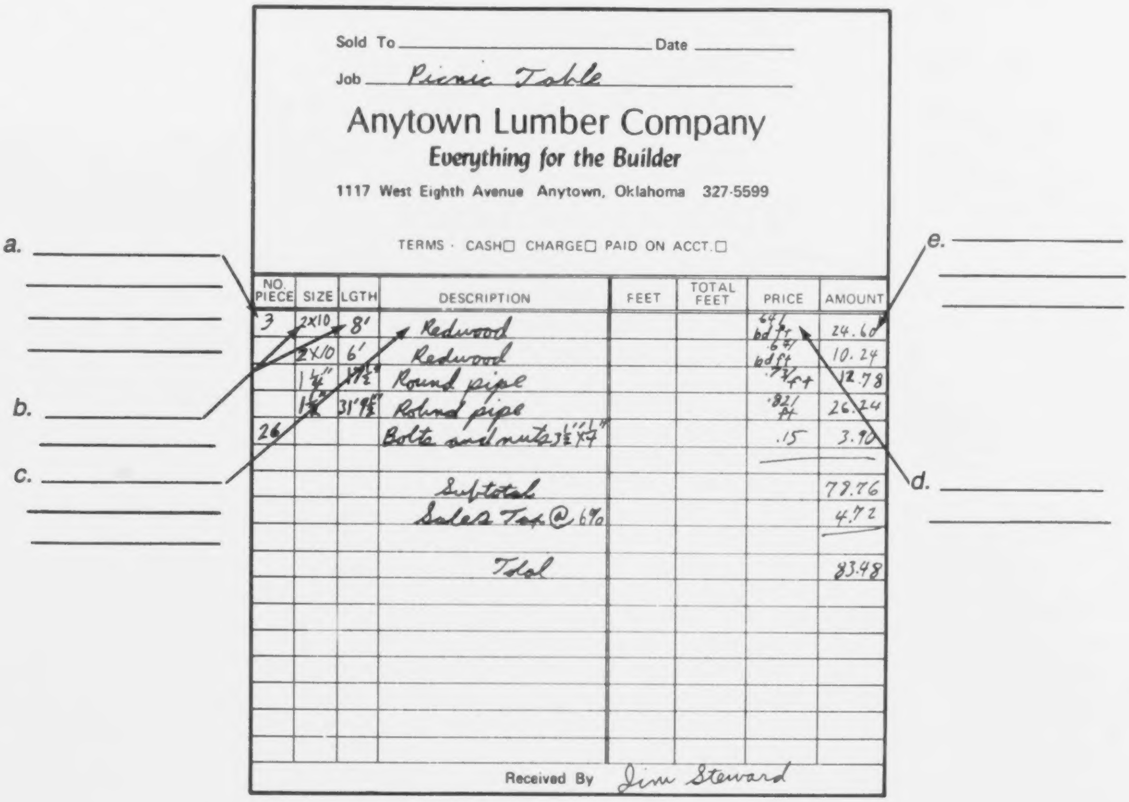
   a. ____________________

   b. ____________________

   c. ____________________

   d. ____________________

10. Label the facts you need to know about each item listed on a shopping bill-of-materials.



Sold To __________ Date ______

Job Picnic Table

Anytown Lumber Company

Everything for the Builder

1117 West Eighth Avenue Anytown, Oklahoma 327-5599

TERMS · CASH☐ CHARGE☐ PAID ON ACCT.☐

NO. PIECE	SIZE	LGTH	DESCRIPTION	FEET	TOTAL FEET	PRICE	AMOUNT
3	2x10	8'	Redwood			.64/bd ft	24.60
	2X10	6'	Redwood			.64/bd ft	10.24
	1¼"	17½'	Round pipe			.71/ft	12.78
	1¼"	31'9½"	Round pipe			.82/ft	26.24
26			Bolts and nuts 3½"×¼"			.15	3.90
			Subtotal				79.76
			Sales Tax @ 6%				4.72
			Total				83.48

Received By Jim Steward

BEST COPY AVAILABLE

TEST

11. Match terms associated with material descriptions to their correct definitions. Write the correct numbers in the blanks.

______a. Foot length of material regardless of thickness and width

______b. Device used to construct an object or to give stability to an object

______c. Wood produced from any needle- or cone-bearing tree

______d. Thickness and width of board to nearest inch

______e. Standard established for measuring and inspecting materials to ensure quality

______f. Piece of lumber 1 inch thick, 12 inches long, and 12 inches wide

______g. A 12" × 12" surface regardless of thickness

______h. Logs or timbers that have been dressed for use as structural materials

______i. Wood produced from any broad-leaved tree bearing its seeds in a closed cavity

______j. Thin layer or sheet of wood glued to base material

______k. Actual size of lumber after it has been surfaced

______l. Amount of material needed to cover 100 square feet

______m. Wood that has been planed to a smooth surface and uniform size

______n. Fabricated wood product made of layers of veneer joined with adhesive (glue)

1. Softwood
2. Hardwood
3. Plywood
4. Veneer
5. Surfaced wood
6. Nominal measurement
7. Actual measurement
8. Grade
9. Board foot
10. Running foot
11. Square foot
12. Square
13. Lumber
14. Fastener

12. Match units of measure to the lumber products they measure. Write the correct numbers in the blanks.

______a. Boards, dimension lumber, structural lumber, shop and factory lumber

______b. Molding and trim

______c. Plywood, particle board, drywall, sheathing, paneling, certain hardwoods, milled boards, and speciality products such as flooring and ceiling tile

1. Board foot
2. Square foot
3. Running foot

TEST

13. Match units of measure to the construction materials they measure. Write the correct numbers in the blanks.

______a. Steel, nails

______b. Corrugated steel siding

______c. Metal siding, roofing, sheet iron, shingles

______d. Some steel products

______e. Some steel rods, chain cable

______f. Lathe, sometimes shingles when a square is broken

1. Running foot
2. Square foot
3. Square
4. Bundle
5. Weight
6. Sheet

14. State the steps for computing board feet, square feet, and running feet.

Board feet

a. ____

____

b. ____

____

c. ____

____

Square feet

a. ____

____

b. ____

____

c. ____

____

Running feet — ____

____

TEST

15. Match types of wood fasteners to their correct uses. Write the correct numbers in the blanks.

Nails

______a. Used to nail shingles

______b. Used to nail interior finishes, ceilings, and cabinet work

______c. Used to construct forms

______d. Used to nail sheeting, shiplap, and fencing

______e. Used to nail flooring

______f. Used to nail rolled roofing and composition shingles

______g. Used to fasten wood to concrete

______h. Used to nail siding

______i. Used to fasten hinges

______j. Used in fence construction

______k. Used to nail galvanized iron to wood

______l. Used to nail plasterboard

______m. Used to fasten wood to bricks or masonry

1. Common
2. Box
3. Finishing
4. Flooring
5. Shingle
6. Roofing
7. Plasterboard
8. Hinge
9. Duplex
10. Wire staple
11. Lead-head
12. Concrete
13. Masonry

Wood screws

______a. Used in production work; considered to have a greater drawing power than a regular screw head

______b. Used to attach and suspend articles

______c. Used in cabinet work to attach hinges; can be spaced to give an ornamental effect

______d. Used to prevent splitting material; can be spaced to give an ornamental effect

______e. Used to fasten wood to brick or concrete

______f. Used to attach or fasten pieces of wood together when screw head must be flush with surface

1. Flat-head
2. Round-head
3. Oval-head
4. Phillips-head
5. Lag
6. Screw hook

TEST

Bolts

______a. Used to attach metal to wood

______b. Used to attach wood to wood in heavy wood construction

______c. Used to join small objects to walls and other objects

1. Machine
2. Carriage
3. Toggle

(NOTE: Test items 16 through 22 list the assignment sheets that are considered an important part of this test. If they have not been completed, check with your instructor.)

16. Read and interpret drawings.
17. Draw a three-view sketch.
18. Calculate board feet and the cost of lumber sold by the board foot.
19. Calculate cost of materials other than lumber.
20. Determine cutting bill-of-materials.
21. Determine total cost of a project.
22. Complete plans for a project.

PLAN PROJECT CONSTRUCTION
UNIT IV

ANSWERS TO TEST

1. a. Are the materials I will need readily available or obtainable?
   b. Am I skilled enough to complete the construction project?
   c. Do I have the tools I will need to complete the project?
   d. Do I have adequate drawings, or can I sketch or draw the project myself?
   e. Is the cost of the project within my limits?

2. a. 2
   b. 1
   c. 4
   d. 3
   e. 6
   f. 5

3. a. 1
   b. 3
   c. 2

4. a. 2
   b. 1
   c. 3

5. a. Leader line
   b. Extension lines
   c. Center line
   d. Dimension line
   e. Object line
   f. Border line
   g. Cutting-plane lines (section lines)
   h. Hidden line
   i. Phantom line
   j. Break line

6. a. 1
   b. 3
   c. 2

7. a. End view
   b. Front or side view
   c. Top view

8. a

9. a. Name of item
   b. Number of pieces that will need to be cut of each item named
   c. Dimensions of each item
   d. Description of each item

ANSWERS TO TEST

10. a. Number of pieces needed per item
    b. Dimensions of item
    c. Description of item
    d. Unit cost of item
    e. Total cost of item

11. a. 10
    b. 14
    c. 1
    d. 6
    e. 8
    f. 9
    g. 11
    h. 13
    i. 2
    j. 4
    k. 7
    l. 12
    m. 5
    n. 3

12. a. 1
    b. 3
    c. 2

13. a. 5
    b. 6
    c. 3
    d. 2
    e. 1
    f. 4

14. **Board feet**

    a. Use the formula $\frac{N \times T \times W \times L}{12}$, where N is number of pieces, T is thickness in inches, W is width in inches, and L is length in feet

    b. Use nominal sizes in figuring board feet, except for lumber less than 1 inch thick, which is figured as 1 inch

    c. Round fractional board feet to next full board foot

    Square feet

    a. Use the formula A = W × L, where A is area, W is width, and L is length

    b. To find number of units needed (sheets, tiles, pieces, etc.), divide number of square feet to be covered by total square feet in one unit in which material is sold

    c. Round fractional units to the next whole unit in which material is sold

    Running feet — Measure the distance in which the required product will be used

ANSWERS TO TEST

15. **Nails**

a. 5
b. 3
c. 9
d. 1
e. 4
f. 6
g. 12
h. 2
i. 8
j. 10
k. 11
l. 7
m. 13

Wood screws

a. 4
b. 6
c. 3
d. 2
e. 5
f. 1

Bolts

a. 2
b. 1
c. 3

16. Evaluated to the satisfaction of the instructor

17. Evaluated to the satisfaction of the instructor

18. Evaluated to the satisfaction of the instructor

19. Evaluated to the satisfaction of the instructor

20. Evaluated to the satisfaction of the instructor

21. Evaluated to the satisfaction of the instructor

22. Evaluated to the satisfaction of the instructor

MAINTAIN FARM PLUMBING
UNIT V

UNIT OBJECTIVE

After completing this unit, the student should be able to join steel, copper, and PVC pipe. The student will show this ability by completing the job sheets and unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student should be able to

1. Match to their correct definitions terms associated with plumbing.
2. Match various kinds of pipe to their correct uses.
3. Identify common pipe fittings and valves.
4. Identify basic tools needed to maintain farm plumbing.
5. Match joining methods to their correct descriptions.
6. Select from a list common sizes of pipe and copper tubing used in plumbing.
7. Demonstrate the ability to
    a. Join galvanized steel pipe.
    b. Join copper tubing.
    c. Join PVC pipe.

MAINTAIN FARM PLUMBING
UNIT V

SUGGESTED ACTIVITIES

I. Unit contents

  A. Objective sheet

  B. Suggested activities

  C. Information sheet

  D. Job sheets

    1. Job Sheet #1 — Join Galvanized Steel Pipe

    2. Job Sheet #2 — Join Copper Tubing

    3. Job Sheet #3 — Join PVC Pipe

  E. Test

  F. Answers to test

II. Instructor's guide

  A. Review unit and plan presentation.

  B. Obtain materials to supplement unit.

    1. Equipment and materials for job sheet procedures

    2. Samples of fittings, valves, and types of pipe

    3. Samples of copper tubing and pipe of various sizes

    4. Pamphlet, "Planning for an Individual Water System," published by the American Association of Vocational Instructional Materials (AAVIM)

    5. Book *Residential Plumbing*

    6. Competency profiles

    (NOTE: Items 4, 5, and 6 above are available from the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

  C. Provide students with unit.

SUGGESTED ACTIVITIES

D. Introduce unit.

SUGGESTIONS:

- Discuss the savings and convenience of do-it-yourself plumbing repair. Make your point by asking students to guess the hourly labor rate charged by plumbers. Write these figures on the board and then write down the local charge.
- Give students examples of estimated per-job charges for such services as cleaning septic tanks and laying lateral lines, laying down a watering system, plumbing an outbuilding, adding a watering trough to the existing system, and so forth. Have students discuss plumbing work that they or their families have undertaken.
- Point out that many of the skills needed to do plumbing jobs can be learned and performed by the homeowner or farmer. Emphasize that much of the knowledge and skill needed for basic farm plumbing jobs will be covered in this unit.
- Discuss unit and specific objectives, stressing that mastery of the specific objectives leads to accomplishment of the unit objective.

E. Discuss information and job sheets.

1. Use Information Sheet, Section I to introduce students to terms and definitions associated with plumbing.

   SUGGESTIONS:

   - Discuss the definition of plumbing, stressing that plumbing means more than piping water.
   - Show students examples of appropriate terms.

2. Use Information Sheet, Section II to discuss kinds of pipe and their uses.

   SUGGESTIONS:

   - Show students examples of each type of pipe as you discuss specific uses for each.
   - Take students on a walking tour of the Vo-Ag building and have them identify types and uses of pipe found.
   - Invite a local plumbing supplier to talk to the class about the advantages, disadvantages, and costs associated with the types of pipe listed in this section of the information sheet.

SUGGESTED ACTIVITIES

3. Use Information Sheet, Section III to introduce students to common pipe fittings and valves.

   SUGGESTIONS:

   - Review the definitions of *fitting* and *valve* in Section I of the information sheet.
   - Show students examples of the various fittings and valves, pointing out the different pipe for which each is designed and the different applications for each.
   - Invite a local plumbing supplier or plumber to talk to the class about fittings and valves and their applications.

4. Use Information Sheet, Sections IV and V to introduce students to the basic tools needed and joining methods used to maintain farm plumbing systems.

   SUGGESTIONS:

   - Before class, lay out at work stations in the shop all of the tools and materials needed for each of the job sheet procedures. Take students to the shop and allow them to examine and identify each of the tools.
   - While still in the shop, demonstrate each of the job sheet procedures, pointing out correct use of each tool and explaining the different joining methods as you demonstrate them. Explain to the students that later in the unit when they go to the shop, they will have the opportunity to perform and practice the skills that you are demonstrating.

5. Use Information Sheet, Section VI to discuss common sizes of pipe and copper tubing.

   SUGGESTIONS:

   - Show students examples of the common sizes of pipe and copper tubing, or have the local plumbing supplier do this when talking to the class about the different kinds of pipe and their uses.
   - Stress that it is important to know the different applications for copper tubing and pipe, as well as to remember that pipe is measured by its *inside* diameter while tubing is measured by its *outside* diameter.

6. Have students complete Job Sheets #1 through #3. Allow students to practice each procedure until it has been mastered at an acceptable level.

F. Give test.

G. Critique test and discuss in class.

SUGGESTED ACTIVITIES

H. Reteach and retest as necessary.

I. Complete appropriate section of competency profiles.

III. Unit references

A. Barclay, Leney. *Residential Plumbing.* Stillwater, Oklahoma: Mid-America Vocational Curriculum Consortium, Inc., 1980.

B. Henderson, G. E. "Planning for an Individual Water System." Athens, Georgia: American Association for Vocational Materials, 1982.

C. Ripka, L. V. *Plumbing Installation and Design.* Chicago, Illinois: American Technical Society, 1978.

D. Smith, Eddie. *Agricultural Mechanics.* Stillwater, Oklahoma: State Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, 1977.

E. Wantiez, Gary W. *Air Conditioning and Refrigeration Fundamentals.* Stillwater, Oklahoma: Mid-America Vocational Curriculum Consortium, Inc., 1984.

MAINTAIN FARM PLUMBING
UNIT V

INFORMATION SHEET

I. Terms and definitions associated with plumbing

   A. Plumbing — Piping and pipe attachments used to carry water, gas, and air and to drain sewage and waste

   B. PVC (polyvinyl chloride) — Rigid plastic pipe

   C. Threading — Cutting spiral grooves on end of pipe to facilitate joining

   D. Reaming — Removing burrs from inside edge and end of pipe

   E. Pipe compound (DOPE) — Substance applied to steel pipe threads to help seal the joint

   F. Thread tape (Teflon tape) — Material used as a joint sealant in place of pipe compound

   G. Fittings — Those parts of piping system used to join pipes

   H. Valves — Those fittings containing a device that regulates flow or permits flow in one direction only

   (NOTE: Fittings are available for nearly all joining situations and angles, including joining different kinds of pipe and different sizes of pipe.)

   I. Galvanized — Plated with zinc

   J. Flange — Projecting rim or collar on a pipe or fitting to hold it in place, give it strength, guide it, or attach it to something else

   K. Sleeve — Tubelike part that fits over or around another part

   L. Ferrule — Short tube or bushing for tightening a joint

II. Uses of various kinds of pipe

   A. Black steel — Used for natural and liquid propane (LP) gas, oil, and compressed-air lines

   B. Galvanized steel — Used for water lines

   C. Copper tubing — Used for water lines and refrigeration applications

   (NOTE: Copper tubing used for water is measured by its inside diameter, and copper tubing used for refrigeration is measured by its outside diameter. In order to get the correct size when purchasing copper tubing, be sure to state the intended use.)

INFORMATION SHEET

D. Cast iron — Used for sewage systems

E. Brass or lead — Used for traps and drains

(NOTE: Brass and lead pipes are seldom used in new construction today because they are so expensive. PVC piping is being used instead because it is durable and inexpensive.)

F. Flexible plastic — Used for water lines

(NOTE: Flexible plastic pipe, sometimes referred to as *black plastic pipe*, is being used less today because its quality does not hold up over long periods of time. Over the past few years, it was used extensively for rural cold water lines, but as leaks have occurred, it is being replaced with PVC pipe.)

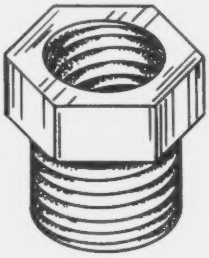
G. PVC plastic (rigid plastic) — Used for pressurized cold water, drain, waste, and vent applications and for natural gas lines

H. CPVC (chlorinated polyvinyl chloride) plastic — Used for hot or cold water lines

III. Common pipe fittings and valves (Figures 1-16)

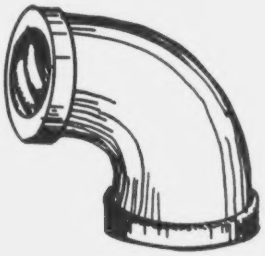
A. Bushing

FIGURE 1



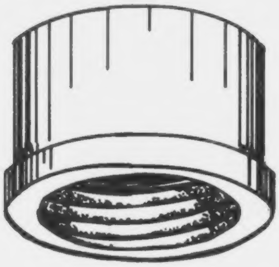
B. 90-degree elbow

FIGURE 2



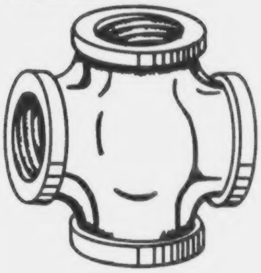
C. Cap

FIGURE 3



D. Straight cross

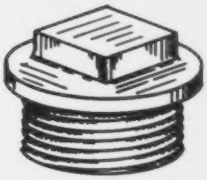
FIGURE 4



INFORMATION SHEET

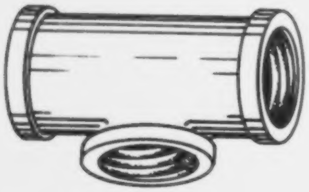
E. Plug

FIGURE 5



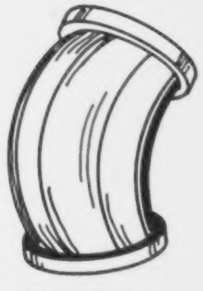
F. Tee ("T")

FIGURE 6



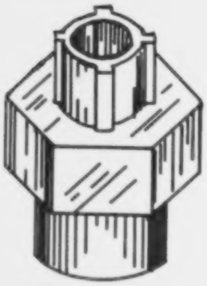
G. 45-degree elbow

FIGURE 7



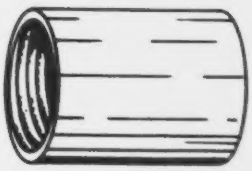
H. Union

FIGURE 8



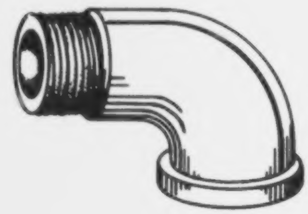
I. Coupling

FIGURE 9



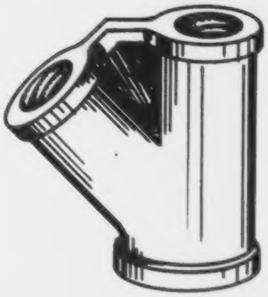
J. 90-degree street elbow

FIGURE 10



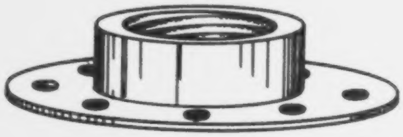
K. Wye ("Y")

FIGURE 11



L. Floor flange

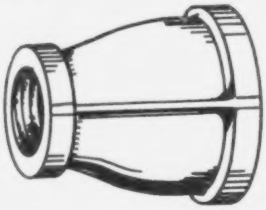
FIGURE 12



INFORMATION SHEET

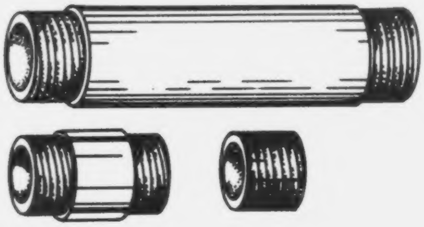
M. Bell reducer

FIGURE 13



N. Nipple

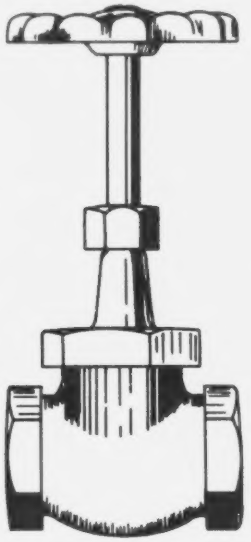
FIGURE 14



O. Valve

(NOTE: This external view is a fair representation of both the globe and gate valves. Consult your supplier as to the difference in the two types and their applications.)

FIGURE 15



P. Ball valve

(NOTE: Ball valves are available for water and gas plumbing applications, but the internal makeup is different for each application. Ball valves are convenient because they can be fully opened or closed with only a one-quarter turn.)

FIGURE 16

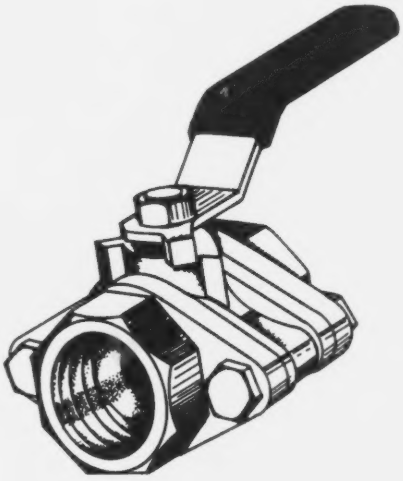


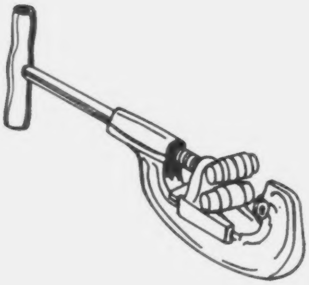
Figure 16 used with permission of NIBCO, Inc., *Plumbing Installation and Design*, by L.V. Ripka, 1978.

INFORMATION SHEET

IV. Basic tools necessary to maintain farm plumbing (Figures 17-33)

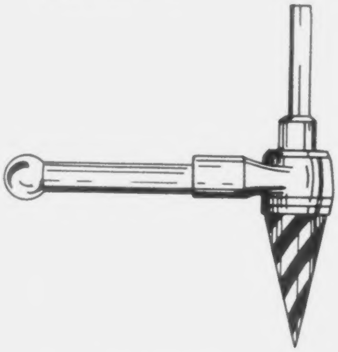
A. Cutter

FIGURE 17



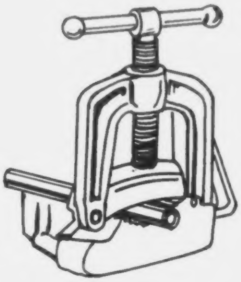
B. Reamer

FIGURE 18



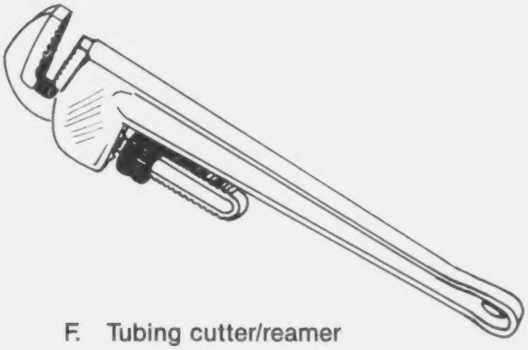
C. Pipe vise

FIGURE 19



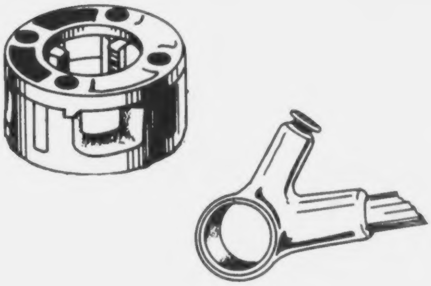
D. Pipe wrench

FIGURE 20



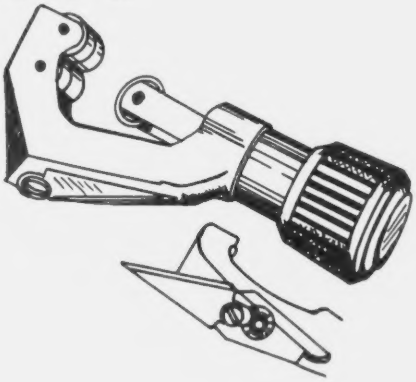
E. Pipe die and die stock

FIGURE 21



F. Tubing cutter/reamer

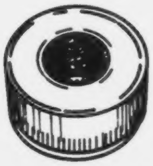
FIGURE 22



INFORMATION SHEET

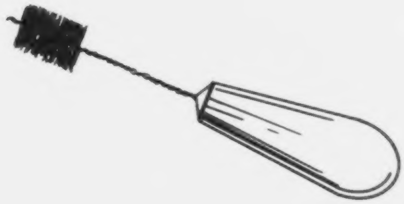
G. Copper-tubing brush

FIGURE 23



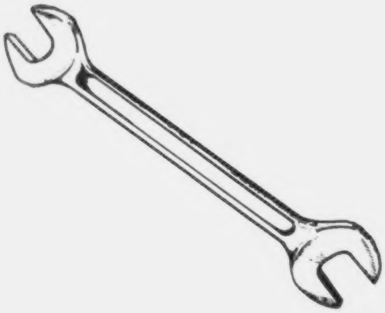
H. Copper-fitting brush

FIGURE 24



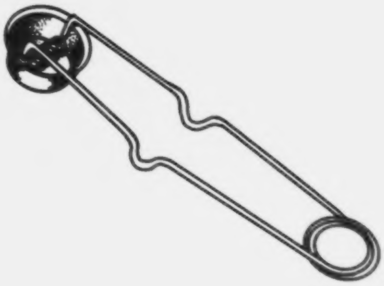
I. Open-end wrench

FIGURE 25



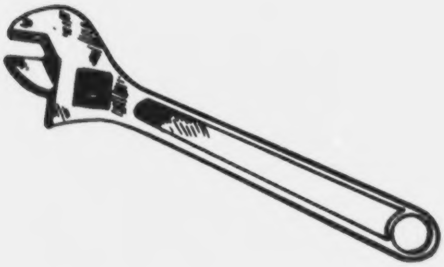
J. Striker

FIGURE 26



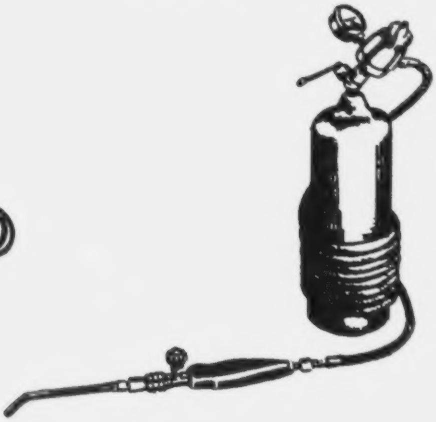
K. Adjustable wrench

FIGURE 27



L. Torch and gas cylinder

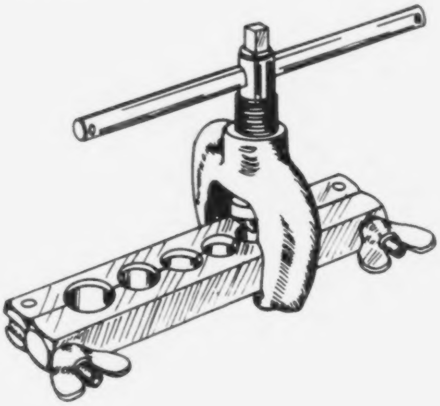
FIGURE 28



INFORMATION SHEET

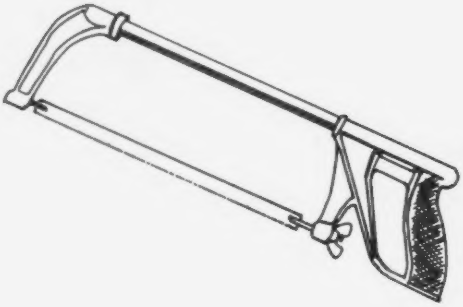
M. Flaring tool and block

FIGURE 29



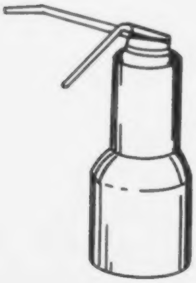
N. Hacksaw

FIGURE 30



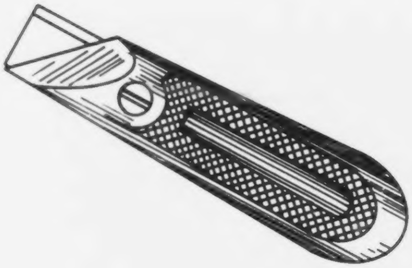
O. Cutting-oil can

FIGURE 31



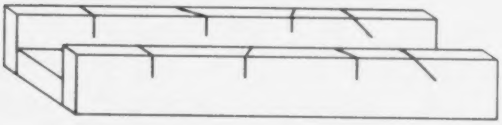
P. Knife

FIGURE 32



Q. Miter box

FIGURE 33



INFORMATION SHEET

V. Descriptions of joining methods

A. Screw joint — Screwing together threaded fittings or pipes

B. Sweat joint — Soldering together copper fittings or tubes

C. Compression joint — Squeezing a ferrule to copper tubing by tightening a compression nut into fitting

D. Flare joint — Widening end of copper tubing to fit over joined tubing and securing with flare nut

E. Cement joint — Gluing together PVC fittings or pipes

VI. Common sizes of pipe and copper tubing used in plumbing

(NOTE: Pipe size is determined by inside diameter; tubing size is determined by outside diameter.)

A. Plastic or steel pipe

1. ¼ inch
2. ½ inch
3. ¾ inch
4. 1 inch
5. 1 ¼ inch

B. Copper tubing

1. ¼ inch
2. ⅜ inch
3. ½ inch
4. ¾ inch
5. 1 inch

MAINTAIN FARM PLUMBING
UNIT V

JOB SHEET #1 — JOIN GALVANIZED STEEL PIPE

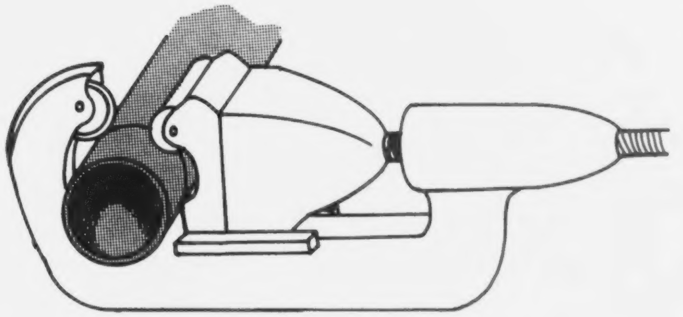
I. Equipment and materials

- A. Galvanized steel pipe of size specified by instructor
- B. Appropriate pipe fitting
- C. Die and die stock
- D. Pipe vise
- E. Wire brush
- F. Oil can and cutting oil
- G. Pan for catching cutting oil
- H. Pencil or flat file
- I. Shop towels
- J. Pipe cutter
- K. Reamer
- L. Eye protection

II. Procedure

- A. Put on eye protection
- B. Cut pipe to specified length
  1. Secure pipe in vise
  2. Mark place for cut with pencil or file
  3. Open pipe cutter until it fits over pipe
  4. Locate cutter wheel on cut mark as shown in Figure 34

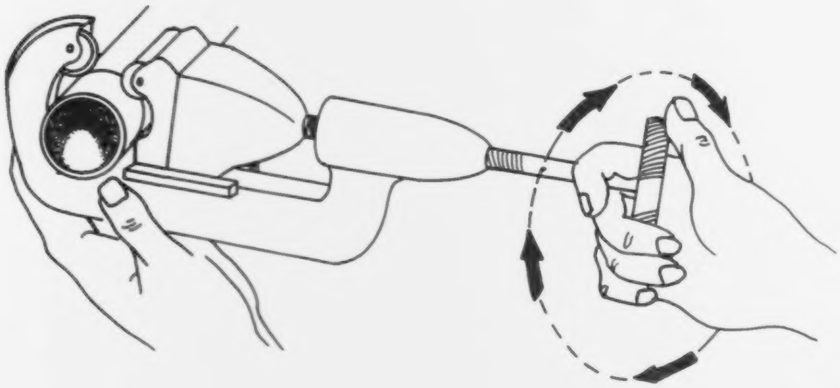
FIGURE 34



JOB SHEET #1

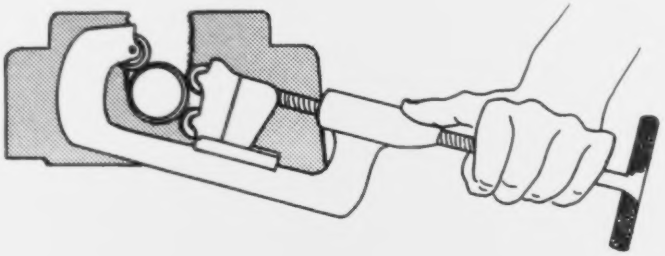
5. Snug cutter up to pipe by rotating screw handle as shown in Figure 35; take care not to overtighten as overtightening can break cutter wheel

FIGURE 35



6. Rotate cutter counterclockwise to start groove (Figure 36)

FIGURE 36



7. Tighten cutter handle one-quarter turn for each full revolution around pipe, continuing process until pipe is cut

CAUTION

When cutting short pieces of pipe, take care not to cut your arm while rotating cutter around pipe.

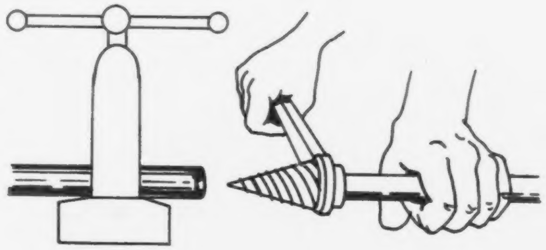
8. Discard cut-off piece of pipe, and clean cutter and pipe in vise with shop towel, taking care not to cut your fingers

JOB SHEET #1

C. Ream pipe to remove burrs

1. Insert reamer tip into pipe by applying light pushing pressure (Figure 37)

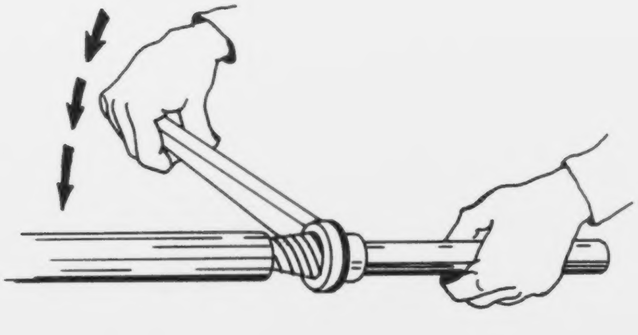
FIGURE 37



2. Rotate reamer in clockwise direction, while applying light pressure (Figure 38)

   (NOTE: The reamer should bite instantly when proper pressure is applied. Make sure to turn the reamer in the correct direction; it can be damaged if rotated in the wrong direction.)

FIGURE 38



3. Continue rotating reamer in clockwise direction—removing reamer to inspect your progress occasionally—until all burrs are removed

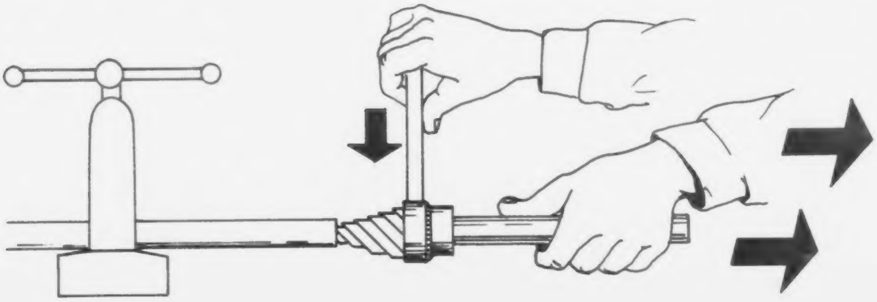
CAUTION

The edges of the pipe are sharp. Take care not to cut your fingers when inspecting for burrs.

4. Remove reamer from pipe by pulling back while continuing to rotate (See Figure 39)

JOB SHEET #1

FIGURE 39

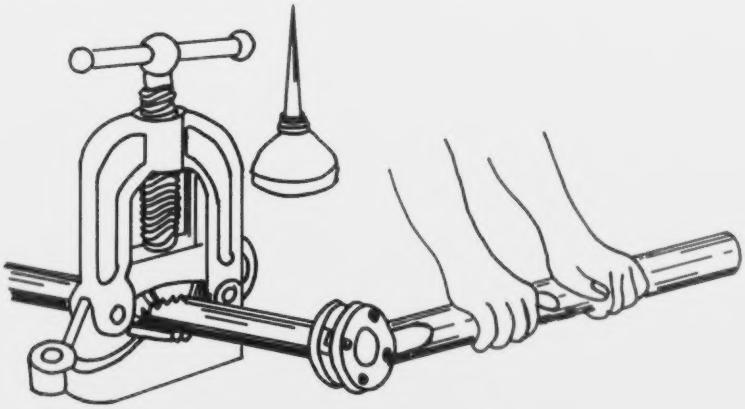


5. Clean reamer with shop towel

D. Thread pipe

1. Place pan under pipe vise to catch cutting oil
2. Lubricate with cutting oil end of pipe to be threaded
3. Place die in die stock and secure
4. Place die straight on pipe and turn clockwise, while applying gentle pushing pressure and plenty of cutting oil (Figure 40)

FIGURE 40



5. Continue turning die, applying pressure and cutting oil, until desired number of threads are cut
6. Release die by turning ratchet lock 180 degrees

JOB SHEET #1

7. Remove die by turning counterclockwise; hold die stock firmly so as not to drop it when it comes to end of threads

8. Clean pipe threads with wire brush

E. Join pipe and fitting by screwing together snugly

F. Clean work area and store equipment and materials properly

MAINTAIN FARM PLUMBING
UNIT V

JOB SHEET #2 — JOIN COPPER TUBING

I. Equipment and materials

A. Copper tubing of size specified by instructor

B. Appropriate fittings for sweat, compression, and flare joints

C. Compression ring (ferrule)

D. Compression nut

E. Flare nut

F. Tubing cutter/reamer

G. Sand cloth, emery cloth, or steel wool

H. Brush for applying flux

I. Flux

J. Torch

K. Gas cylinder with wrench

L. Striker

M. Wire solder

N. Wiping cloth

O. Flaring tool and block

P. Open-end wrench or flare-nut wrench

Q. Adjustable wrench

R. Pipe vise

S. Pencil or flat file

T. Appropriate eye protection and leather gloves

(NOTE: Colored safety glasses must be worn when soldering a sweat joint.)

JOB SHEET #2

II. Procedure for sweat joint

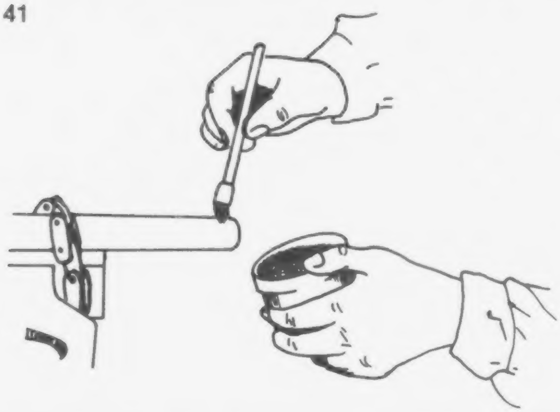
- A. Put on eye protection
- B. Cut tubing to desired length
  1. Secure tubing in vise
  2. Mark place for cut with pencil or file
  3. Fit tubing cutter over tubing, locating cutting wheel over cut mark
  4. Snug cutting wheel to tubing by rotating screw handle
  5. Start groove, and then tighten cutter handle one-quarter turn for each full revolution around tubing, continuing process until tubing is cut
  6. Discard cut-off piece of tubing, and clean cutter and pipe in vise with shop towel or cloth, taking care not to cut your fingers
- C. Ream tubing to remove burrs
  1. Flip out reaming tool on cutter/reamer
  2. Insert tool into tubing and rotate back and forth until all burrs are removed

CAUTION

The edges of the tubing are sharp. Take care not to cut your fingers when inspecting for burrs.

  3. Clean reamed end of tubing with sand cloth, emery cloth, or steel wool
- D. Clean fitting socket with sand cloth, emery cloth, or steel wool
- E. Apply a thin coat of flux to tubing end and fitting socket (Figure 41)

FIGURE 41



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JOB SHEET #2

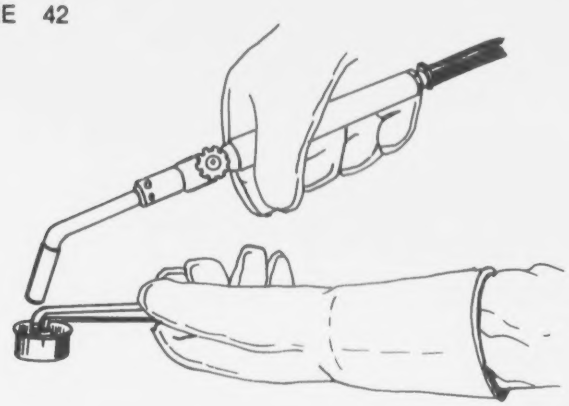
F. Insert tubing end into fitting socket, twisting while inserting in order to spread flux evenly

G. Clean away excess flux with a cloth

H. Put on colored safety glasses and leather gloves

I. Light torch with striker and adjust flame (Figure 42)

FIGURE 42

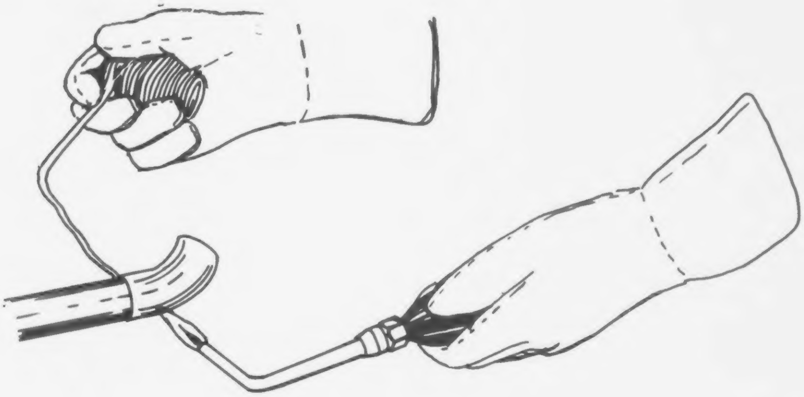


J. Move torch flame around entire joint, holding blue inner cone of flame about 1/8 inch from work

K. Apply solder to heated joint by touching it to tube-fitting juncture with a gentle pushing movement (Figure 43)

(NOTE: The size of the tubing determines the approximate amount of solder needed. For instance, 1/2-inch tubing will require about 1/2 inch of wire solder.)

FIGURE 43



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JOB SHEET #2

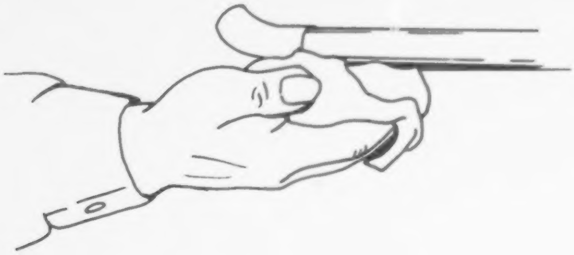
L. When ring of solder appears at end of fitting, discontinue solder application

M. Turn off torch, take off gloves, and allow solder to cool

(NOTE: Do not apply water to cool the fitting.)

N. Wipe excess solder from joint with a clean cloth, taking care not to burn your fingers (Figure 44)

FIGURE 44



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III. Procedure for compression joint

A. Put on eye protection

B. Cut tubing to desired length, following procedure outlined for sweat joint

C. Slide compression nut onto tubing

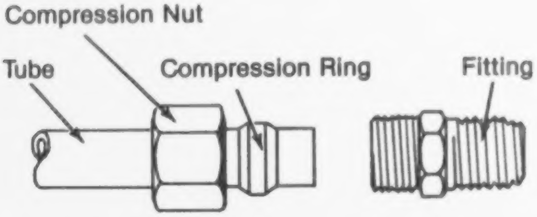
D. Slide compression ring (ferrule) onto tubing

(NOTE: The nut and ring are slipped onto tubing *before* reaming because after reaming they might not fit over the end of the tubing.)

E. Ream end of tubing, following procedure outlined for sweat joint

F. Slide mechanical joint fitting over tube end (Figure 45)

FIGURE 45



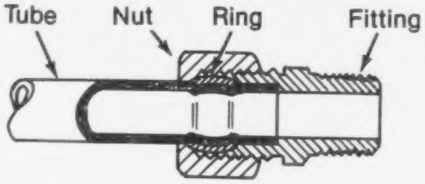
Source: *Plumbing Installation and Design*

JOB SHEET #2

G. Tighten compression nut onto fitting with a wrench (Figure 46)

(NOTE: By tightening this nut, you compress the compression ring into the tubing and thus seal the joint.)

FIGURE 46



Source: *Plumbing Installation and Design*

IV. Procedure for flare joint

A. Put on eye protection

B. Cut tubing to desired length, following procedure outlined for sweat joint

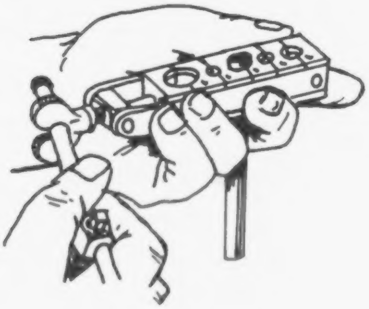
C. Ream ends of tubing to remove all burrs

(NOTE: This step is very important to ensure metal-to-metal contact.)

D. Slip flare nut over end of tubing

E. Clamp tubing in flaring block so that end of tube is slightly above face of block (Figure 47)

FIGURE 47



F. Place yoke of flaring tool on block so that beveled end of compression cone is over tubing end

JOB SHEET #2

G. Turn compressor screw down firmly a few turns and then back it out

H. Continue turning and backing out until flare is made

(NOTE: This process tends to make a smooth, polished flare and will lessen the chances of work-hardening the tubing.)

I. Remove flaring tool

J. Assemble joint by placing fitting squarely against flare, engaging flare nut with fitting threads, and tightening with two wrenches—one on nut and one on fitting

K. Clean work area and store equipment and materials properly

MAINTAIN FARM PLUMBING
UNIT V

JOB SHEET #3 — JOIN PVC PIPE

I. Equipment and materials

A. Miter box or tube cutter with special blade for plastic

B. Pocket knife or deburring tool

C. Primer specifically formulated for PVC and CPVC plastics

D. Solvent cement specifically formulated for PVC and CPVC plastics

E. Two small brushes, one for primer and one for solvent cement

F. CPVC or PVC pipe of size specified by instructor

G. Appropriate fitting

H. Wiping cloth

I. Eye protection

II. Procedure

A. Put on eye protection

B. Cut pipe *squarely* to desired length, using miter box or tube cutter

(NOTE: If the end of the pipe is not square, the pipe will not seat correctly in the fitting and a weak joint will result.)

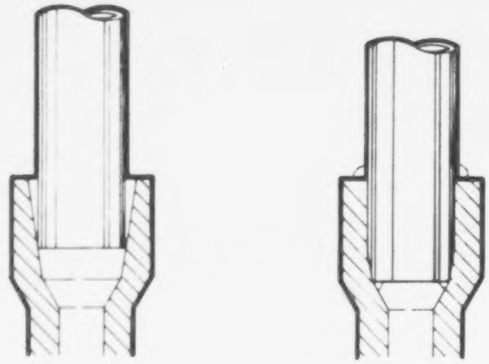
C. Use pocket knife or deburring tool to smooth and ream end of pipe to remove all burrs

(NOTE: If the pipe edges are rough, the rough edges will scrape away the solvent during assembly.)

D. Check for interference fit: the pipe should go in only about halfway; it *should not* go all the way to seat of fitting (See Figure 48)

JOB SHEET #3

FIGURE 48



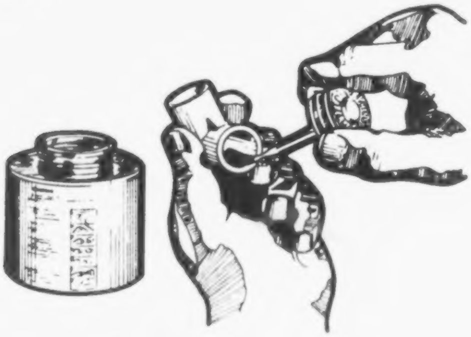
Interference Fit   Fit After Cementing

Used with permission of NIBCO, Inc., *Plumbing Installation and Design*, by L.V. Ripka, 1978.

E. Apply primer to inside of fitting and then to outside of pipe to depth that will be taken into fitting when seated (Figure 49)

(NOTE: Take care not to leave a puddle in the bottom of the fitting as a cured puddle would result in some flow restriction.)

FIGURE 49



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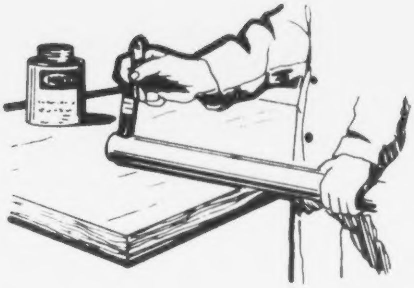
F. Wait five to fifteen seconds

G. Apply solvent cement while surfaces are still wet from primer

1. Brush full, even coat of solvent cement on inside of fitting, taking care not to leave a puddle in bottom of fitting
2. Apply solvent cement to pipe to same depth as that of primer (See Figure 50)

JOB SHEET #3

FIGURE 50



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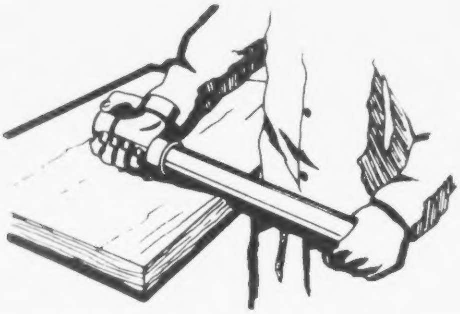
H. Immediately fit pipe and fitting together before solvent evaporates; use enough force to ensure that pipe bottoms in fitting socket, and give pipe about one-quarter turn as you push it in (Figure 51)

FIGURE 51



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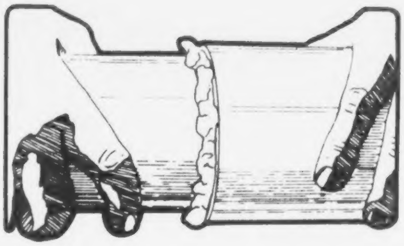
I. Hold joint firmly for about ten seconds to allow solvent to start bonding the surfaces

(NOTE: If you position the pipe and release too soon, the interference fit will force the pipe out of the socket.)

J. Check for correct bead: if ring of cement pushed out during assembly does not go all the way around joint (See Figure 52), you have not used enough cement and the joint could leak

JOB SHEET #3

FIGURE 52



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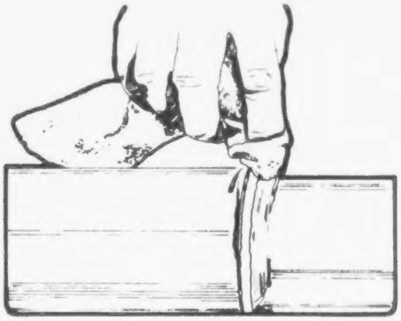
K. If bead looks complete, wipe off excess cement with a clean cloth (Figure 53)

FIGURE 53



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L. Allow joined pipe to cure for twenty-four hours before testing

M. Clean work area and store equipment and materials properly

MAINTAIN FARM PLUMBING
UNIT V

TEST

NAME ______________________________ SCORE ______________

1. Match to their correct definitions terms associated with plumbing. Write the correct numbers in the blanks.

_____a. Tubelike part that fits over or around another part

_____b. Material used as a joint sealant in place of pipe compound

_____c. Cutting spiral grooves on end of pipe to facilitate joining

_____d. Rigid plastic pipe

_____e. Plated with zinc

_____f. Piping and pipe attachments used to carry water, gas, and air and to drain sewage and waste

_____g. Those fittings containing a device that regulates flow or permits flow in one direction only

_____h. Substance applied to steel pipe threads to help seal the joint

_____i. Removing burrs from inside edge and end of pipe

_____j. Short tube or bushing for tightening a joint

_____k. Projecting rim or collar on a pipe or fitting to hold it in place, give it strength, guide it, or attach it to something else

_____l. Those parts of piping system used to join pipes

1. Plumbing
2. PVC (polyvinyl chloride)
3. Threading
4. Reaming
5. Pipe compound (DOPE)
6. Thread tape (Teflon tape)
7. Fittings
8. Valves
9. Galvanized
10. Flange
11. Sleeve
12. Ferrule

2. Match various kinds of pipe to their correct uses. Write the correct numbers in the blanks. Some blanks may contain more than one answer.

_____a. Used for water lines

_____b. Used for traps and drains

_____c. Used for natural and liquid propane (LP) gas, oil, and compressed-air lines

1. Black steel
2. Brass or lead
3. Galvanized steel

TEST

_____d. Used for sewage systems

_____e. Used for pressurized cold water, drain, waste, and vent applications and for natural gas lines

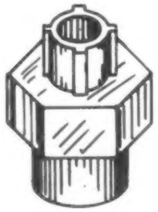
_____f. Used for water lines and refrigeration applications

_____g. Used for hot or cold water lines

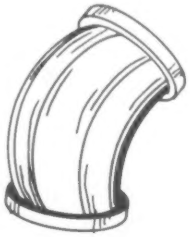
4. Copper tubing
5. Cast iron
6. Flexible plastic
7. PVC plastic (rigid plastic)
8. CPVC (chlorinated polyvinyl chloride) plastic

3. Identify the following common pipe fittings and valves. Write the correct names in the blanks.

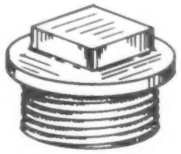
Bushing
Cap
Plug
45-degree elbow
90-degree elbow
Straight cross
Tee ("T")
Union
Coupling
Wye ("Y")
Bell reducer
Valve
90-degree street elbow
Floor flange
Nipple
Ball valve



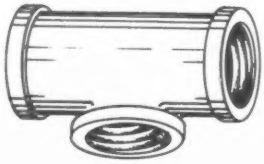
a. ____________________



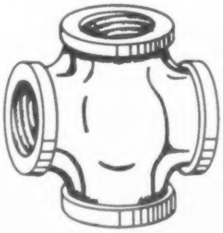
b. ____________________



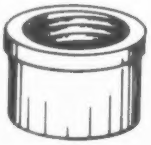
c. ____________________



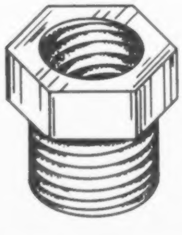
d. ____________________



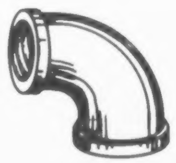
e. ____________________



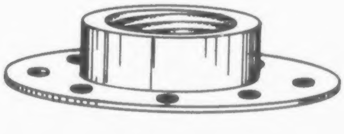
f. ____________________



g. ____________________

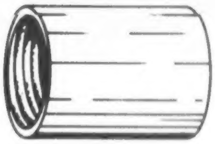


h. ____________________

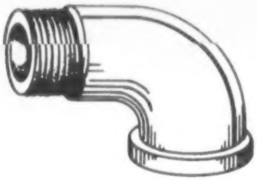


i. ____________________

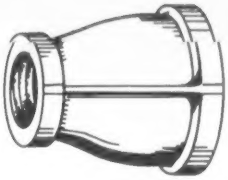
TEST



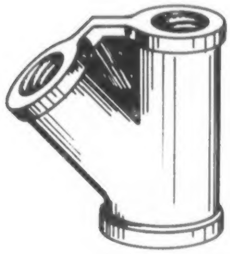
j. ____________________



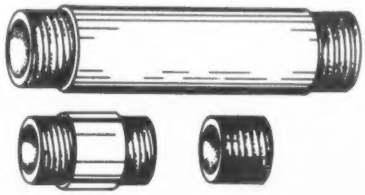
k. ____________________



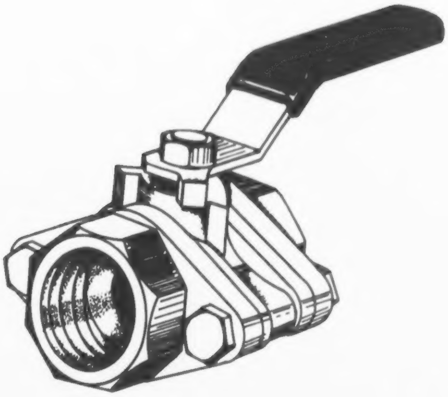
l. ____________________



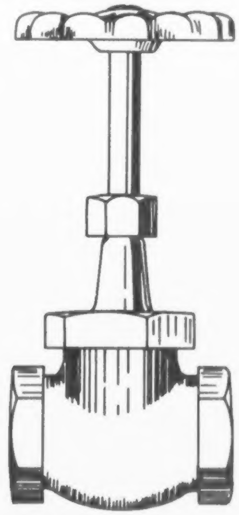
m. ____________________



n. ____________________



o. ____________________

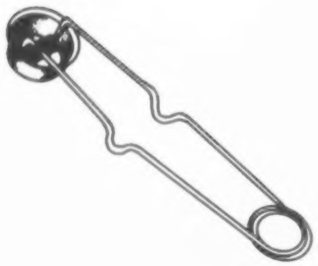


p. ____________________

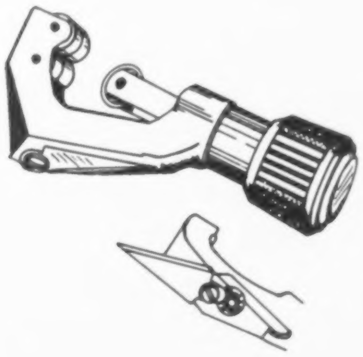
TEST

4. Identify the following basic tools needed to maintain farm plumbing. Write the correct names in the blanks.

Cutter
Pipe vise
Pipe die and die stock
Cutting-oil can
Reamer
Miter box
Pipe wrench
Tubing cutter/reamer
Copper-tubing brush
Copper-fitting brush
Flaring tool and block
Knife
Open-end wrench
Striker
Adjustable wrench
Torch and gas cylinder
Hacksaw



a. ______________________________



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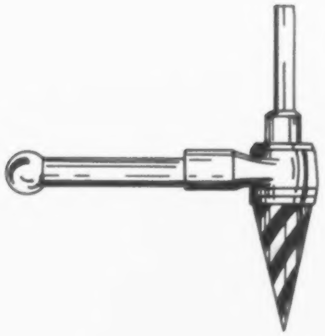

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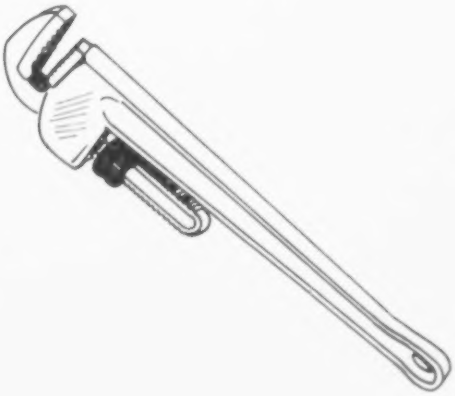
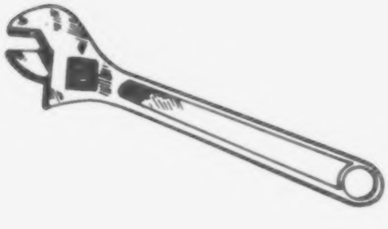


d. ______________________________

TEST



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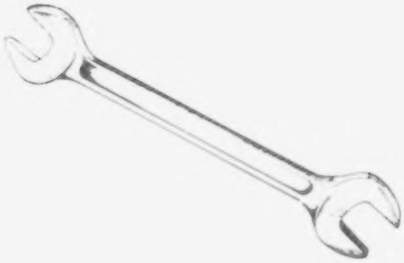

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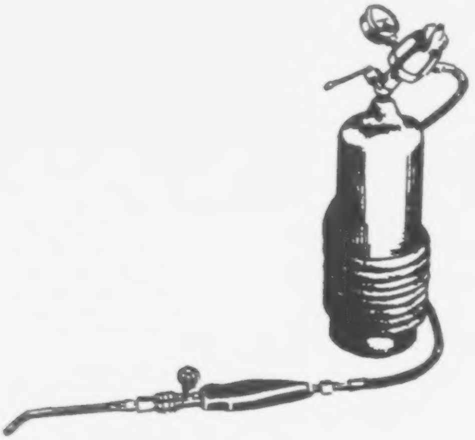

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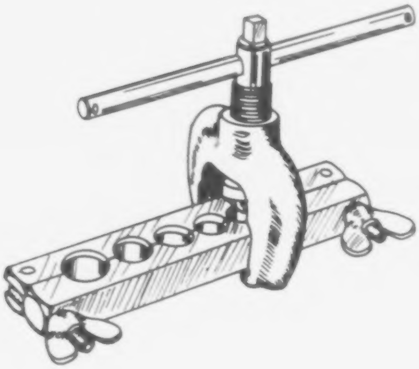

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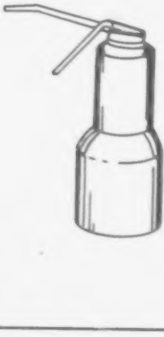
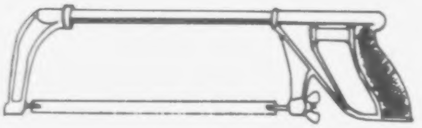
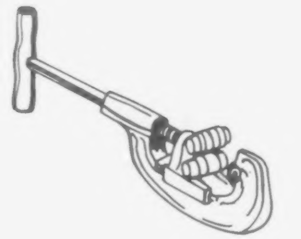




i. ______________________________

j. ______________________________

TEST



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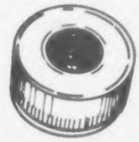
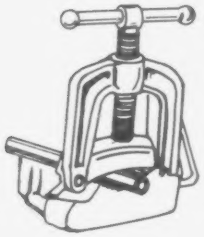


l. ______________________________



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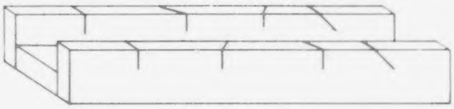

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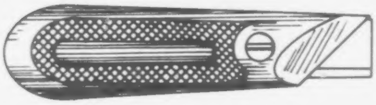
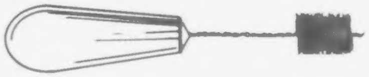


o. ______________________________



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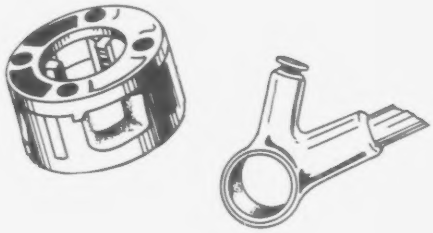

q. ______________________________

TEST

5. Match the following joining methods to their correct descriptions. Write the correct numbers in the blanks.

_____a. Gluing together PVC fittings or pipes	1. Screw joint
_____b. Screwing together threaded fittings or pipes	2. Cement joint
_____c. Squeezing a ferrule to copper tubing by tightening a compression nut into fitting	3. Sweat joint
_____d. Soldering together copper fittings or tubes	4. Compression joint
_____e. Widening end of copper tubing to fit over joined tubing and securing with flare nut	5. Flare joint

6. Select from the following list common sizes of pipe and copper tubing used in plumbing. Write an "X" in the blank before each correct answer.

Plastic or steel pipe	**Copper tubing**
_____a. ¼ inch	_____a. ¼ inch
_____b. 1 inch	_____b. ⅜ inch
_____c. 1 ¼ inch	_____c. ½ inch
_____d. ½ inch	_____d. 7/16 inch
_____e. 3 inch	_____e. 1 inch
_____f. 2 inch	_____f. ¾ inch
_____g. ¾ inch	_____g. 1 ½ inch

(NOTE: Test item 7 lists the job sheets. They are an important part of this test. If they have not been completed, check with your instructor.)

7. Demonstrate the ability to

   a. Join galvanized steel pipe.

   b. Join copper tubing.

   c. Join PVC pipe.

MAINTAIN FARM PLUMBING
UNIT V

ANSWERS TO TEST

1. a. 11
   b. 6
   c. 3
   d. 2
   e. 9
   f. 1
   g. 8
   h. 5
   i. 4
   j. 12
   k. 10
   l. 7

2. a. 3, 6
   b. 2
   c. 1
   d. 5
   e. 7
   f. 4
   g. 8

3. a. Union
   b. 45-degree elbow
   c. Plug
   d. Tee ("T")
   e. Straight cross
   f. Cap
   g. Bushing
   h. 90-degree elbow
   i. Floor flange
   j. Coupling
   k. 90-degree street elbow
   l. Bell reducer
   m. Wye ("Y")
   n. Nipple
   o. Ball valve
   p. Valve

4. a. Striker
   b. Tubing cutter/reamer
   c. Reamer
   d. Pipe wrench
   e. Adjustable wrench
   f. Open-end wrench
   g. Torch and gas cylinder
   h. Flaring tool and block
   i. Cutting-oil can
   j. Hacksaw
   k. Cutter
   l. Copper-tubing brush
   m. Pipe vise
   n. Miter box
   o. Knife
   p. Copper-fitting brush
   q. Pipe die and die stock

5. a. 2
   b. 1
   c. 4
   d. 3
   e. 5

ANSWERS TO TEST

6. **Plastic or steel pipe** — a, b, c, d, g

   Copper tubing — a, b, c, e, f

7. Performance skills evaluated to the satisfaction of the instructor